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Telephony

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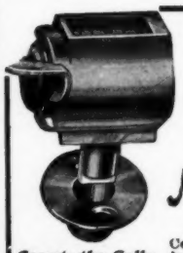

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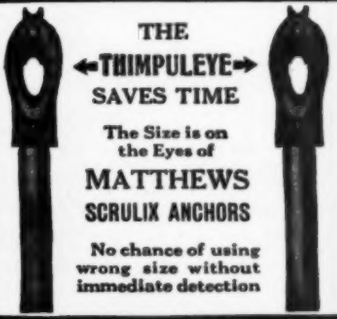

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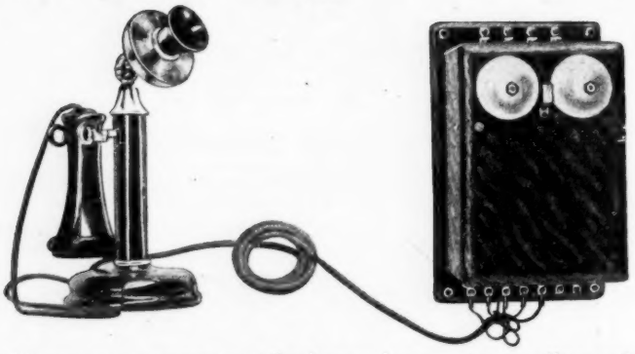

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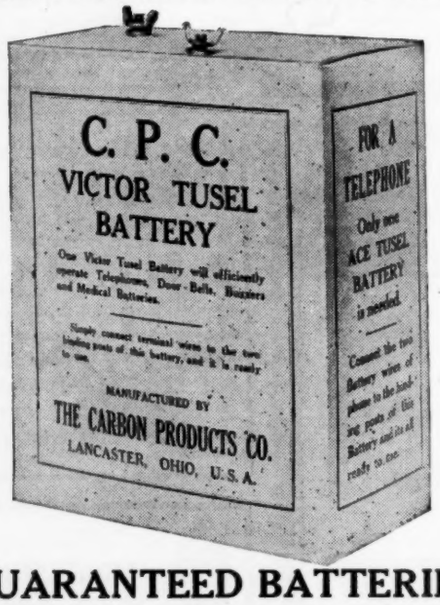
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Telephony.

THE AMERICAN TELEPHONE JOURNAL

Comprising Telephony, American Telephone Journal, Telephone Weekly, Telephone Magazine, Telephone Securities, The Telephone, Sound Waves.

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CURRENT OPINIONS AND COMMENTS

For the first time, legislation is now pending before Congress governing the consolidation of competing telephone companies and providing a method which will avoid violation of the federal anti-trust laws.

This proposed legislation is embodied in Senate Bill No. 1313, introduced by Senator Willis, of Ohio, and described in last week's issue. It is expected this bill will be enacted, and that it will have an important effect on the telephone industry.

The public demand for the elimination of dual telephone service has been frequently discussed in these columns. As the telephone business developed, and economic conditions changed, it became increasingly apparent that competition must eventually end and that the Independents and the Bell would effect a division of territory.

Competition did a monumental work. It popularized the telephone and stimulated its use until today the United States leads the world in telephone development.

If the saying is true that the man who makes two blades of grass grow where only one grew before is a benefactor of the race, then the men who created competition in the telephone business twenty-five years ago are deserving of recognition, for they did much to place that wonderful utility within the reach of all.

* * * *

In the evolution of the telephone art, as related to its most efficient use by the public, however, wise observers have come to insist on the policy of one system to a community. Working toward this end there have been important developments in the past few years.

Both Independent and Bell leaders, recognizing this public demand, have co-operated in many localities to give the people what they wanted—unified telephone service. Each has pulled out and given way to the other at various competitive points, the survivor usually being the company that had made the most headway in that particular community, which seemed the logical outcome.

* * * *

Eliminating competition is a ticklish question, however, in view of the provisions of existing federal anti-trust laws, even if the public demand it, and the various telephone consolidations have been put through according to the rulings of the Department of Justice.

With both sides in accord, and the public urging it, it became the practice to effect a merger or consolidation with the Attorney General's consent. Where the Bell organization took over a competing plant, it was supposed to give up an equal number of stations elsewhere for the purpose of maintaining its ratio of telephones to Independent telephones.

This was considered in the nature of a makeshift which might be upset by any new Attorney General who entertained different ideas.

The Willis bill is designed to clear up the situation and create definite legal landmarks to guide future action. While its immediate purpose is to pave the way for a consolidation of the Ohio State Telephone Co. and the Ohio Bell company, in response to a public demand for one telephone service, the provisions of the bill must apply to all states to meet constitutional requirements.

* * * *

This consolidation will be effected (after Congress passes the bill) by the two properties being taken over by a new corporation in which both interests will be represented, the Bell predominating, as it has the larger investment.

Outside of Cincinnati and Cleveland, two-thirds of the remaining telephones in Ohio are said to be Independent. They are operated by well-managed, prosperous companies and are serving the public most satisfactorily. Doing away with competition at the 80 odd towns where the Ohio State Telephone Co. has exchanges is not expected to injure other Independent interests of the state in any way.

* * * *

The purposes of the Willis bill have been endorsed by the directors of the United States Independent Telephone Association at a meeting which had the largest attendance of any such conference held in some time. Twenty-three directors were present and a full discussion preceded the vote of approval. They represented all elements—operating companies at competitive points, companies which have bought out Bell exchanges and companies which have divided territory with

the Bell, as well as spokesmen for the Independent manufacturers.

A committee was appointed to act in connection with the proposed legislation with instructions to see that the interests of the members of the association are protected, including the interests of the Independent manufacturers. This committee is comprised of: President F. B. MacKinnon, Secretary C. C. Deering, G. W. Robinson, St. Paul; H. Linton Reber, St. Louis, and J. B. Earle, Waco, Texas.

* * * *

It is to be noted that there is a home rule feature of the Willis bill. Before the Interstate Commerce Commission can approve of the consolidation or merger of competing telephone properties the application must have the sanction of the state commission. Unless the public favor and demand such action, this preliminary step, it is believed, will not be taken.

The feeling prevails among those familiar with affairs at Washington that the Interstate Commerce Commission will do nothing to run counter to the wishes of a state regulatory body. The federal government became more than tired of stirring up fights over state's rights during the period of government control of the wires. Any move looking towards changes in the telephone situation must originate in the states.

If this legislative move means that the public is determined to secure better telephone service, it is up to telephone men on both sides to co-operate toward that end. Only by so doing can their companies get the rates necessary to make it a paying business—and rate increases are needed by many today.

* * * *

The efficient telephone manager who by hard work and close attention to business, has made a place for his company in the community deserves the opportunity to stay and serve the public after competition disappears, if it is to disappear. Many Independent telephone plants of this description dot the map of many states. They have won the upper hand in the competitive era, and doubtless would welcome the chance to see how it feels to be alone in the field. They are entitled to it.

Furthermore, there will always be a demand for telephone men of that caliber, and as the world grows to lean more and more on the utility of telephone service so will increase the need of such men to handle it.

* * * *

Speaking before the United States Chamber of Commerce convention, E. N. Hurley, Chicago, manufacturer and head of the shipping board during the war, expressed some truths which should be widely disseminated. After observing the experiments already made, he believes that government and municipal ownership of utilities will not solve the problem.

He advised the utility corporation and the public "to get together and iron out their troubles and wipe out any doubt or distrust that lingers."

Proceeding, Mr. Hurley said: "Government operation in industrial service is a flat failure from the standpoint of service to the public. This is not only true in America, but it is a proved fact throughout the world. I am convinced that it will be found that the lack of personal efficiency under municipal or governmental industrial ownership spells financial failure for the enterprise."

He might have added that it also results in poor service for the public, higher taxes and waste. Mr. Hurley pressed home the point that the people must realize that confidence in public utility securities cannot be obtained by constant, unjust criticism, and declared that "no public utility corporation can finance its requirements out of earnings."

Business men of experience appreciate these facts, and they are doing a public service in calling attention to them. If the men who make and administer the laws realized the situation more fully it would be far better for the country as a whole.

Use Human Interest in Your Ads

Public Resents Being "Preached At" or Commanded to Co-operate by Telephone Company in Terse, Direct-to-the-Point Language—Try Preparing Your Ads in a Story Form and Notice the Results

By Frank H. Williams

The manager of a certain telephone company was talking to an advertising man recently and the telephone manager had a real grievance.

"There's no use in my doing any advertising," said this manager. "Of course I want to better our service and get more co-operation from the public and all that, but I tell you the folks of this town just simply won't respond to any advertising.

"I've run several series of ads in which I've told subscribers just what they should do and what they should not do in order to get the best possible service out of their telephones and what's the result—the ads have gotten only replies in which the subscribers kidded us or in which they complained that we are not doing our part or in which they told us to 'cut out the preaching and get down to business.'

"There's no use in my trying to do anything with advertising to better our service because experience has shown me conclusively that the folks of this city don't rise to ads the way they should. This town may be entirely different from other towns in this respect, but the conditions aren't changed by that fact."

"Would you mind letting me see some of the ads you've been running?" queried the ad man.

"Sure I'll let you see 'em," exclaimed the manager. "And if you can tell me how to improve them or suggest any new line for advertising I'll be mighty glad to get your suggestions."

The telephone manager at this point handed to the ad man a large sheaf of proofs and the ad man spent quite a considerable amount of time going over the proofs carefully. Finally he looked up at the telephone manager with a smile.

"You won't mind if I pick your ads to pieces—get out my little hammer and knock them badly, will you?" queried the ad man.

"Not at all," ejaculated the telephone man. "Go right ahead! I'm thoroughly convinced they're no good and I'm pretty nearly convinced that no advertising we could do would be any good, so fire ahead! You can't make me mad!"

"In the first place," said the ad man, "your ads have a rather nasty dictatorial tone. You start right out and tell subscribers to do thus and so. You explain at length just what they must do and then at the end of each ad you say that

if they will co-operate in doing these things they will aid the company in giving better service.

"But each ad sounds more like a command than it does like a plea for co-operation. Consequently each of these ads has that very thing which the readers complained about—the ads sound like preaching. And as your experience with these ads has indicated, folks do not like to be preached at.

"It seems to me that these ads get off on the wrong foot. Now if you could get on a different sort of a slant I'm pretty fairly convinced that you would find the ads would get the sort of results you want."

"What sort of a slant would you suggest?"

"Why not tell the folks some human interest stories of this exchange?" queried the ad man. "Folks are always interested in stories. That's why magazines are so successful and why so many of the daily newspapers carry fiction features.

Since the telephone exchange is such an intimate part of the daily lives of most of the up-and-doing people of this city, I'm sure they would be interested in reading some interesting stories about the doings of the exchange. And, of course, in each story you would get over some specific point which would help you give better service if adopted by the general public. What do you think of the idea?"

"Well, I don't know," responded the telephone manager, rather dubiously. "I'm pretty much set against any kind of advertising for this telephone company, but if you think it will get it over—we'll try it out. I sure want to get more co-operation from the public and there's a chance that this will turn the trick. Go ahead and hop to it."

So the ad man hopped to it immediately and, of course, the ads turned the trick.

Now all the foregoing is much more interesting when couched in the form of a conversation between an ad man and a telephone manager than if it had been presented merely as a straight report without any of the characteristics of a story, isn't it?

And just as the foregoing has been made more interesting by the adoption of the story form in telling about the affair, just so much of the telephone company's advertising would be much more interesting to the general public and would be much more effective, if it, too, were told in the story form.

It is all very well to issue advertisements in which the public is told to "Talk Distinctly" and, of course, such advertisements have a certain amount of effect in getting the public to do the desired thing, but how many more people would read the advertisement and profit by the suggestions it contained if it was framed something like this:

The Subscriber Who Wouldn't Talk Distinctly.

Mr. Knott Co-operator was a man who always mumbled indistinctly over the telephone. He was clear enough and distinct enough when talking to folks in ordinary conversation, but the minute he began using the telephone all his clearness of enunciation went up in blue smoke and his speech sounded like that of a tired street car conductor murmuring the names of passing thoroughfares.

One day Mr. Knott Co-operator was in the midst of the biggest business deal of his career. And it was vitally important to the success of this deal that he secure the signature of a certain capitalist by 12 o'clock, noon.

It was 11:45 o'clock at the time Mr. Knott Co-operator realized that he must secure the capitalist's signature at once.

Immediately Mr. K. Co-operator turned to his telephone. He adjusted the receiver to his ear. As he did so the voice of the operator came to him:

"Number, please."

"Hrump, ump, hrump, uff, uff!" ejaculated Mr. Knott Co-operator with his usual lack of distinctness.

"4567?" queried the operator, anxious to please.

"No—uff, ump, h-h-h-rum, uff, uff and-be-quick-about-it!"

What was the poor operator to do? She asked again for a clearer explanation of the number Mr. K. Co-operator wanted, and she got the same reply along with a lot of stars and bars and words that stung her ears. And she hurried to give him the number she thought was the one he wanted.

Of course, Mr. Knott Co-operator got the wrong number; lost out on his big deal and, naturally, he blamed the telephone company for his loss.

But the fault was all Mr. Knott Co-operator's. When the telephone company manager pointed this out to him in a private conversation, Mr. Co-operator acknowledged his mistake and he is now one of the most distinct enunciators using the company's telephones.

Is there a hint for *you* in this story of Mr. Knott Co-operator?

It is generally a fact that in most things better results can be secured by presenting suggestions in an attractive form than by hurling them like preachments at the public.

So tell the public a story when trying to secure better co-operation from the public in a drive for improved telephone service.

Planning for Ohio Consolidation

A Hundred Million Dollar Company If Congress Passes Willis Bill—Unification of Ohio State and Bell Exchanges to Take Years—Stockholders in Company to Receive in Exchange Preferred Stock in New Corporation

Assuming that the Willis bill providing for the consolidation of competing telephone properties will become a law, plans are going forward for the merger of the Ohio State Telephone Co. and the Ohio Bell Telephone Co.

It is regarded a task of many years to effect complete unification of the properties. Members of the Ohio Public Utilities Commission say ten years, but this is considered by telephone men as an extreme estimate. They concede, however, that it will be a long job.

Discussing the work to be done in Cleveland, the Plaindealer says:

"While officials of the two companies in Cleveland could not say how long the physical change from two competing lines into one uniform line might take, experts in the telephone engineering field ventured the prediction that the job might take from four to six years. 'It's a huge piece of work,' was the consensus of their opinion.

It is assumed on the basis of the legislation and financing plans made public that actual engineering work on the job of connecting the 125,000 subscribers of the Ohio Bell Telephone Co. in Greater Cleveland and the 32,000 Ohio State company subscribers in one company and one set of exchanges cannot possibly begin for several months at least. J. C. Bousch, manager for Cleveland for the Ohio State, said that while he expected the engineering plans were in some state of progress, he had not the slightest idea when any work on them might be commenced.

There are 13 Ohio Bell exchanges and eight Ohio State exchanges in Greater Cleveland, but not one of them could be practically outfitted to take over the work of a united system, according to the engineering advices last night.

This indicates that the unification process here—and in many other large Ohio cities where consolidation of lines is pro-

posed by the announcement of yesterday —will include virtually complete construction of new exchange plants.

The duplication of long distance lines over Ohio and the dependency of the Independent telephone companies of smaller Ohio cities upon these will further complicate the problem of making the two systems into one.

Ohio is one of the most prosperous states in the world in the telephone business which its residents are engaged in. Eight of the 90 cities in the world which have more than 20,000 telephones are Ohio cities, Cleveland, Cincinnati, Columbus, Toledo, Dayton, Akron, Youngstown and Canton. In all these cities but Cincinnati, the Ohio State and Bell interests control or are interested in competing telephone systems."

It is understood that the board of directors of the new company will comprise: Frank A. Davis, chairman of the board of the Ohio State; C. Y. McVey, president Ohio State; Franz R. Huntington, Columbus banker; John Sherwin, chairman board of directors, Union Trust Co., Cleveland; Shirley Toles of Toles, Hoggsett, Ginn and Morley, Cleveland attorneys; Allard Smith, vice-president, Union Trust Co., Cleveland, and general manager of the old Cleveland Telephone Co., and Edgar S. Bloom, Chicago, president, Ohio Bell Telephone Co.

The property of the Ohio State is valued at about $25,000,000, and the Bell estimate their interests at $75,000,000. The new company plans to organize on a $100,000,000 basis if the state utility commission approves. Cleveland financial circles understand that equal amounts of common and preferred stock will be issued and that the American Telephone & Telegraph Co., which owns the common stock of the present Ohio Bell, will take the common stock of the new corporation.

According to Mr. Huntington, holders of Ohio State preferred will receive $102 in new preferred, with the possibility that the $2 may be in cash. Holders of Ohio State common will be given an option of $40 a share in preferred of the new company or cash.

Preferred stock of the new company will be 7 per cent cumulative, subject to retirement at 105. It will be non-voting except in default of four successive quarterly dividends, in which case the preferred will have exclusive voting powers.

According to the statement by Mr. Huntington, the new company cannot have outstanding indebtedness of more than 50 per cent., this to be determined by the public utilities commission, and not more than 75 per cent of the secured debt and preferred stock in aggregate. It is provided that no stock can be issued in priority by the Ohio State Bell Telephone Co. while the preferred is outstanding.

The State Savings & Trust Co. of Columbus is named as trustee for the Ohio State company. A meeting of Ohio State stockholders to approve the tentative plans and take up details of the proposed merger is to be held soon.

Mr. Huntington said that physical consolidation of the systems will be made as rapidly as consistent with sound economy and practical mechanics. It will be up to the engineers, he said, to determine just how soon the final joining of the plants can take place.

The Ohio State Telephone Co., through its toll lines, reaches every county in the state with the exception of Hamilton County, in which Cincinnati is located. The number of stations owned by the Ohio State Telephone Co. is 155,000. The Ohio Bell Company has 301,000.

Cities where competition will be automatically eliminated and a one telephone system inaugurated include Cleveland, Toledo, Findlay, Fostoria, Youngstown, Salem, Canton, Alliance, Massillon, Dayton, London, Washington C. H., Lancaster, Zanesville, Nelsonville, South Charleston, Akron and East Liverpool.

Under date of May 6, the United States Independent Telephone Association sent to its member companies a two-page bulletin relating to the bills pending before Congress. The text of the measure is given in full (as printed in TELEPHONY last week) and President MacKinnon, who signs the bulletin, then adds:

"These bills have been referred to the committee on interstate commerce of the Senate and House. A hearing is to be held on Monday, May 9, at which time representatives of the public and of the industry will be given an opportunity to discuss them.

"The bills are designed to provide a definite procedure for exercising federal control over the transfer of telephone companies, whether it be for the purpose of consolidating competing exchanges, or the sale and purchase of non-competitive properties. The present law provides no definite procedure nor authorizes any federal authority to pass upon telephone consolidations. Therefore, it is proposed by these bills to provide this needed procedure.

"As you will notice, where there are state authorities having jurisdiction over consolidation of telephone companies, the consent of those authorities must first be obtained before any application can be made to the Interstate Commerce Commission for federal approval. In states where no regulatory body has been given authority to pass upon telephone consolidations, application can be made direct to the Interstate Commerce Commission for the federal approval, but before the commission passes upon the application it must send notice to the governor of the states where the property involved is situated, so that opportunity will be given the state authorities to express their opinion on the proposed transaction. In this way ample publicity is provided for every transaction in every state.

"At a meeting of the board of directors of this association held in Chicago, May 2, this proposed law was given careful consideration and the board unanimously voted to approve the purposes of the bill, believing that some such procedure is desirable for the industry. A committee was appointed by the board to guard the interests of the members of the association in connection with this legislation. This committee is: President MacKinnon and Secretary Deering; and G. W. Robinson of St. Paul, Minnesota, H. L. Reber of St. Louis, Missouri, and J. B. Earle of Waco, Texas.

"Should you have any suggestions to make in this matter we ask that you write us immediately."

Editorials have appeared in Ohio papers commenting on the consolidation favorably, but warning the state commission that the public will expect telephone service to cost less in the future.

A. T. & T. Directors Vote $90,000,000 Stock Issue.

The directors of the American Telephone & Telegraph Co. on May 10 voted to issue $90,000,000 of new stock and offer it at par to stockholders of record of May 20 in the ratio of one new share for each five shares held. The stock outstanding now amounts to about $445,000,000. The new stock was provided for at the annual meeting a year ago, when the stockholders voted to increase the authorized capital stock from $500,000,000 to $750,000,000.

Issuance of additional stock also was foreshadowed in March, when the directors increased the annual dividend rate from 8 to 9 per cent. At that time it was stated the company would need considerable new capital to finance its normal growth and that it was the policy to maintain a dividend rate that would maintain the market value of its stock and make offerings of new stock attractive to investors.

"The program since the period of federal control has been, first, to get the service up to pre-war standards, and, second, to get wages up to post-war standards," President H. B. Thayer said in commenting on the new stock issue. "Coincident with these moves and essential to them was an increase in revenue by raising rates. We were prepared, therefore, at the annual meeting in March to announce a change in our dividend rate to a post-war standard, which would make participation in the financing of the business desirable to our stockholders."

Following the announcement A. T. & T. shares declined 1½ points to 106½ in the New York market.

Multiplex Telegraphy—Telephony

Fundamental Principles Underlying Development of Carrier Current Telephony—Commercial Apparatus and Actual Installations—Paper Presented Before the American Institute of Electrical Engineers—Fifth Installment

By E. H. Colpitts and O. B. Blackwell
Western Electric Co. *American Telephone & Telegraph Co.*

Lines.

The electrical design of carrier systems is determined in large part by the problems which arise in the transmission of the carrier currents over the line wires. The comparatively high frequencies used in carrier transmission attenuate much more rapidly in passing along the lines, and have a much greater tendency to cause interference in adjacent circuits than do the ordinary telephone frequencies.

Both attenuation and interference increase rapidly with increase in frequency. Because of this it has been found most economical to make use of the frequency range commencing immediately above the voice range. The systems which have so far been put into commercial use employ frequencies up to about 30,000 cycles.

Because of the high attenuation and interference, carrier transmission is particularly dependent on the use in the circuit of repeaters placed at comparatively frequent intervals. To indicate the importance of repeaters, it is interesting to note that if the Harrisburg-Chicago carrier telephone system, which spans about 750 miles, as described later, were operated without repeaters, it would be necessary under the most favorable line conditions to apply at the sending end of the highest-frequency channel a power of 60 kilowatts. By the use of intermediate repeaters the high-frequency power at no point exceeds 0.1 watt.

Some of the experiments in this art have had the misconception that the mode of transmission of the high frequencies employed in carrier operation was different from that of the ordinary telephone frequencies, and that the carrier frequencies had some unexplained property whereby, although guided by the line wires, large energy losses in the line wires were avoided.

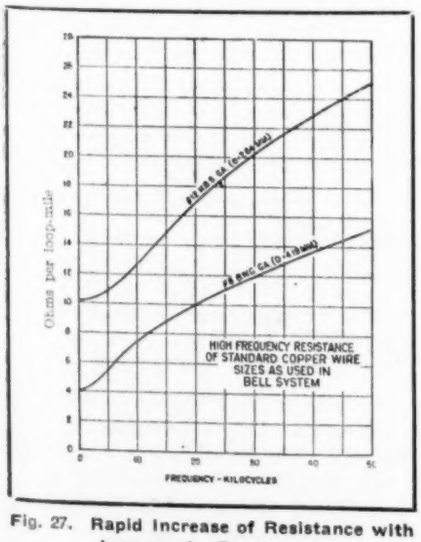
Ohms per loop mile
#12 B.W.S. Ga. (0.205 in.)
#8 B.W.G. Ga. (0.165 in.)
HIGH FREQUENCY RESISTANCE OF STANDARD COPPER WIRE SIZES AS USED IN BELL SYSTEM
FREQUENCY - KILOCYCLES

Fig. 27. Rapid Increase of Resistance with Increase in Frequency.

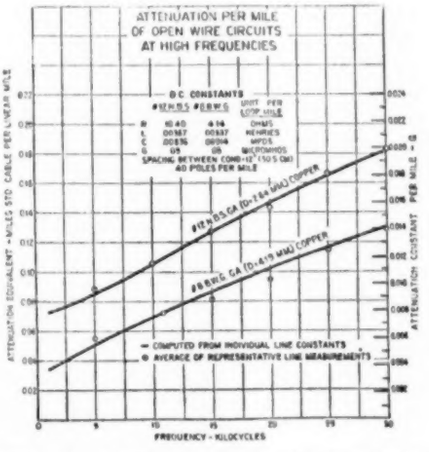
ATTENUATION PER MILE OF OPEN WIRE CIRCUITS AT HIGH FREQUENCIES
D.C. CONSTANTS
#12 B.W.S. (0.205 in.) COPPER
#8 B.W.G. (0.165 in.) COPPER
COMPUTED FROM INDIVIDUAL LINE CONSTANTS
AVERAGE OF REPRESENTATIVE LINE MEASUREMENTS
ATTENUATION EQUIVALENT - MILES STD. CABLE PER LINEAR MILE
ATTENUATION CONSTANT PER MILE
FREQUENCY - KILOCYCLES

Fig. 26. Values of Attenuation Constants at Different Frequencies.

There is, however, no theoretical or experimental basis for this idea. As a matter of fact, the line attenuation of carrier currents is considerably greater than for telephone frequencies and increases rapidly with frequency, due to the increased resistance of the line wires, and increased effective leakage between the line wires at the carrier frequencies.

While it is, of course, proper to picture the mechanism of carrier transmission as one in which the energy is contained in the electromagnetic waves, which are guided by the line wires, this is no less true for the transmission of low frequencies. The difference between radio and wire transmission, whether of high or low frequency, is the difference between unguided and guided waves.

Open Wire Characteristics at Carrier Frequencies.

The two sizes of wire in most common use for open-wire telephone lines in this country are No. 12 N. B. S. gauge (0.102 in. diameter) and No. 8 B. W. gauge (0.165 in. diameter). These wires are strung on pole lines with a normal separation of twelve inches between their centers.

The curves of Fig. 26 give the values of the attenuation constant[18] at different frequencies for circuits of these sizes of wire. The attenuation follows the usual line formulas. That is, the ratio of the currents i_1 and i_2 at two points on a transmission line separated by a distance l, assuming the line so terminated as to make reflection effects negligible, is

$$i_2 / i_1 = e^{-l\alpha}$$

in which α is the real part of the expression

$$\sqrt{(R + jpL)(G + jpC)}$$

In this expression, R and L are the effective loop series resistance and inductance per unit length and G and C are the effective conductance and capacitance between the wires, per unit length.

The formulas covering the action of transmission lines to alternating currents are so well understood[19] that the discussion here will be limited to certain features of particular interest in connection with carrier systems.

It is found that the constants, L and C,

[18]Note: A convenient practical unit of attenuation which has gained large use in telephone engineering is that of the "mile of standard cable," in which α at 800 cycles equals 0.109. The attenuation at carrier frequencies is expressed in terms of the miles of standard cable which at 800 cycles has the same attenuation.

[19]J. A. Fleming: "The Propagation of Electric Currents in Telephone and Telegraph Conductors."
A. E. Kennelly: "The Application of Hyperbolic Functions to Electrical Engineering Problems."
John Mills: "Radio Communication, Theory and Methods With An Appendix on Transmission Over Wires."

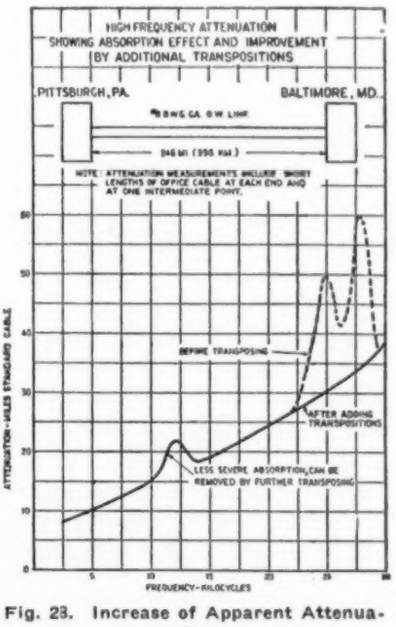
HIGH FREQUENCY ATTENUATION SHOWING ABSORPTION EFFECT AND IMPROVEMENT BY ADDITIONAL TRANSPOSITIONS
PITTSBURGH, PA.
BALTIMORE, MD.
#8 B.W.G. GA. O.W. LINE
246 MI. (396 KM.)
NOTE: ATTENUATION MEASUREMENTS INCLUDE SHORT LENGTHS OF OFFICE CABLE AT EACH END AND AT ONE INTERMEDIATE POINT.
BEFORE TRANSPOSING
AFTER ADDING TRANSPOSITIONS
LESS SEVERE ABSORPTION CAN BE REMOVED BY FURTHER TRANSPOSING
ATTENUATION - MILES STANDARD CABLE
FREQUENCY - KILOCYCLES

Fig. 28. Increase of Apparent Attenuation.

are practically the same at high as at low frequencies. R may be computed by the usual "skin effect" formulas. Its rapid increase in value with increase in frequency is shown in Fig. 27.

The determination of G represents a more difficult task since no theoretical

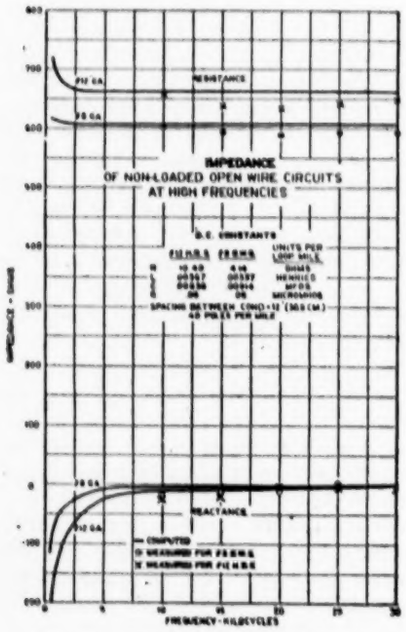

Fig. 29. Impedance Characteristics.

relation has been established between the effective conductance between the wires and frequency. In computing the curve shown, the value of G was taken from measurements of the effective insulation of a group of glass line insulators exposed to ordinary weather conditions, and assumes, therefore, that the effective leakage occurs only at the insulators.

The conductance, for example, at 25 kilocycles, under normal dry weather conditions, is found to be roughly 200 times that measured with direct current.

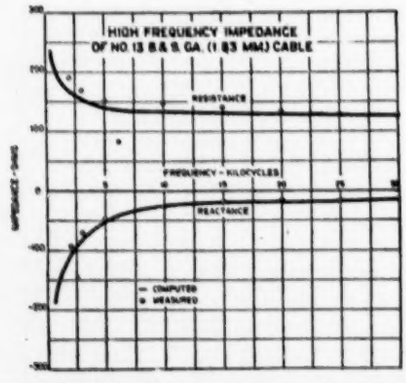

Fig. 31. Impedance of Paper-Insulated Cable Circuit.

It will be noted that the curves computed with the values of the constants so obtained are checked very closely by the actual field measurements which are indicated on the curves by small circles. Since the leakage plays a large part in determining the attenuation, substantial changes in attenuation occur for varying weather conditions. Under wet weather conditions the attenuation will rise materially higher than that shown in the curve.

The apparent attenuation of a circuit may be largely increased by the setting up of induced currents in adjacent wires carried on the same pole line. This is illustrated in the curve of Fig. 28, which is for one of the circuits employed in the operation of the first commercial carrier telephone system between Baltimore and Pittsburgh.

The dotted curve represents excess attenuation originally found in the circuit due to such absorption. After additional transpositions had been cut into the circuit it finally gave the attenuation shown in the full line curve. The smaller attenuation hump shown in the curve at about 12,000 cycles was not eliminated, as its effect was not considered sufficiently serious to justify the expense of further transpositions.

The impedance of a circuit as viewed at terminal and intermediate repeater points is important in determining the proportioning of the connecting apparatus and in determining the amount of amplification which can be given, in systems depending on balance. Fig. 29 shows the impedance characteristic of a long No. 8 B. W. G. circuit.

The curves follow the usual line formulas for characteristic impedance. It will be noted that the impedance is practically a pure resistance with a value of approximately 600 ohms. The fact that the reactance component is negligible makes it possible to design the selecting circuits regardless of the particular line over which a system is to operate.

The effect on repeater amplification of irregularities in impedance is covered in the section under "Line Balancing."

Cable.

Transmission over cables will be discussed here in connection with the unavoidable use of short lengths of cable in open wire lines, for toll entrance in bringing the circuits into the central offices, at river crossings, in passing through cities, etc. Such lengths of cable have two effects:

(a) They introduce a considerable transmission loss due to the inefficiency of cable circuits at these higher frequencies, and

(b) They introduce a large irrregularity in impedance characteristics which, in systems depending on balance for duplex operation, affects radically the amount of amplification which may be obtained at repeater points.

Fig. 30 shows the attenuation, and Fig. 31 shows the impedance of a No. 13 B. & S. gauge paper-insulated cable circuit of the ordinary telephone type.

To reduce both the attenuation of the circuits at these frequencies and the impedance irregularity which short lengths

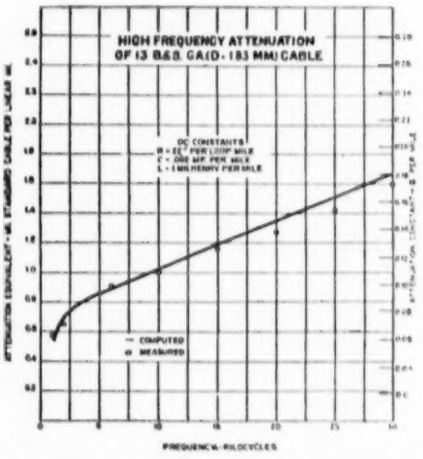

Fig. 30. Attenuation of Paper-Insulated Cable Circuit.

of cable introduce, there has been developed a system of coil inductance loading.

Loading for Carrier Frequencies.

The loading systems which have been developed for cable are adapted to transmit frequencies up to about 30,000 cycles. The coils are spaced about 1,000 feet apart, and the amount of inductance is chosen so as to give the cable circuits the same characteristic impedance as the lines to which they are connected. Fig. 32 shows the attenuation of a No. 13 gauge cable so loaded.

Fig. 33 shows the impedance of a section of line between Harrisburg and Pittsburg as measured at Harrisburg, including two lengths of cable as indicated in the figure. It will be noted that the impedance when the cables are non-loaded is very irregular. The rapid variations in impedance are caused by reflections from the intermediate length of cable at

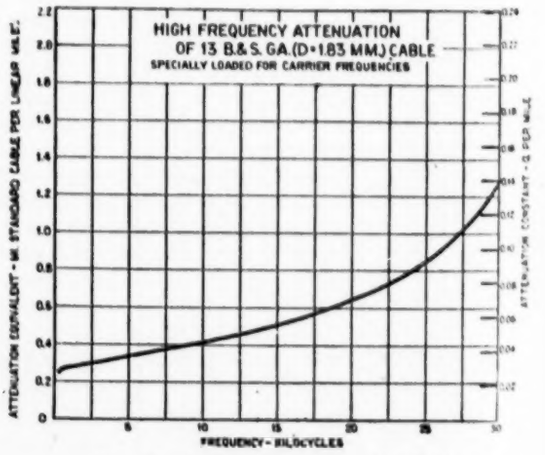

Fig. 32. Attenuation of Loaded Cable.

Altoona, whereas the general drop of the complete impedance curve is due to the terminal cable at Harrisburg.

It will be noted in this case that, due to the terminal cable, the reactance of the

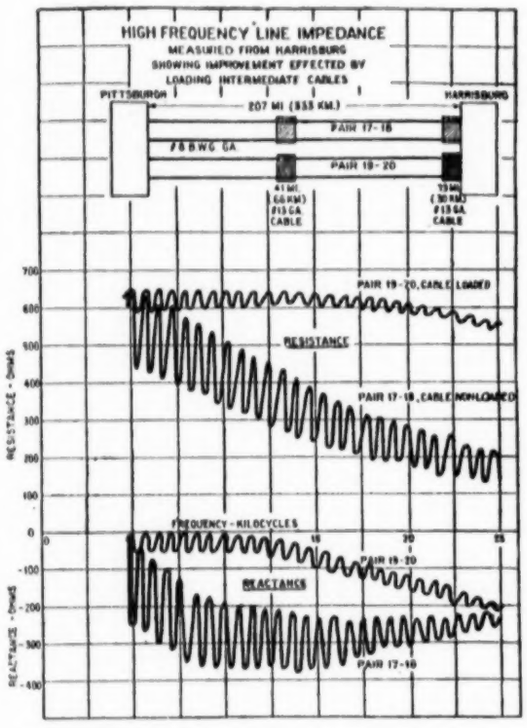

Fig. 33. Impedance of Section of Line Between Harrisburg and Pittsburgh.

circuit as measured from the terminal is not negligible. The decrease in irregularity in impedance as the frequency increases is due to the fact that the attenuation increases with frequency, so that the cable at Altoona is electrically farther away at the higher frequencies. Since, however, the large attenuation has to be made up by larger repeater gains, the smaller apparent irregularity at the higher frequencies is of equal or greater practical importance than that at low frequencies.

It will be noted furthermore that the loading largely overcomes the effect of the two lengths of cable. The slight remaining reactance component, which occurs at the higher frequencies, is largely due to the office wiring at the end where the measurements were made; and the slight remaining irregularity is due to some office wiring at Altoona.

Fig 34 illustrates the effect on attenuation of the loading of intermediate lengths of cable. It shows the improvement introduced in the attenuation of a circuit between Wakefield, Mass., and Portland, Me., due to the loading of three lengths of intermediate cable. This section is a part of the circuit of a carrier telephone installation between Boston, Mass., and Bangor, Me. The importance of loading will be appreciated in this case by noting that at 25 kilocycles the received energy is increased about two hundred times by the loading of the cables.

Under some conditions it has been found convenient to leave lengths of cable in carrier systems unloaded, and to install auto-transformers between the cable and the open wire circuits to reduce the reflection losses introduced by the cables.

Line Balancing for Two-Way Operation.

As already pointed out, two-way operation may be carried out either by the use of different frequencies in the two directions, or by using the same frequency for the two directions but using duplex balancing arrangements at the terminals. When different frequencies are used in the two directions it is sometimes convenient to employ line balance to supplement the selective circuits.

The general problem of line balancing was discussed in some detail in the paper on telephone repeaters already referred to. It will be noted by referring again to the impedance characteristic of a long uniform length of open-wire circuit (Fig. 29) that a balance can be obtained by employing an artificial line consisting simply of a non-inductive resistance of about 600 ohms. Moreover, this resistance gives a good balance for all of the channels employed in a carrier system.

For systems requiring it, balance must be obtained not only at intermediate repeater points but also at each terminal, since the terminal set is itself inherently a repeater. Fig. 35 shows diagrammatically a typical balancing arrangement in which the open-wire and connected apparatus on one side of the hybrid coil is balanced by a resistance and connected apparatus on the opposite side. The office wiring is balanced by a condenser and the high-pass and low-pass filters in the line are balanced by similar arrangements in the balancing line.

There has already been pointed out in the preceding section the manner in which irregularities due to intermediate lengths of cable are cared for by loading. It is important that lines used for carrier operation shall be kept as free as possible from intermediate lengths of cable, lengths of twisted pair, etc. It will be noted that the irregularities in impedance so introduced are similar to those whoch occur at ordinary telephone frequencies, and were discussed in some detail in the paper on telephone repeaters.

Interference Between Circuits—Transpositions.

Any general use of carrier systems in the telephone plant requires that it be possible to operate a number of similar systems over the same pole line without mutual interference—that is, to transmit the same range of carrier frequencies over a number of circuits running closely together on the same line, with only negligible interference between channels of different carrier systems.

Inasmuch as the only means available for preventing interference between circuits where the same carrier frequency is employed in both directions is that of balance between circuits, effected by transpositions, it is obvious that where a number of carrier systems are to be operated on the same pole line, the circuits must be operated on the metallic and not on the ground return basis. Metallic circuits are also desirable for reducing foreign high-frequency interference, such as "static" and that from high-power radio stations employing frequencies in the carrier range.

The transpositions existing in open-wire telephone circuits are generally inadequate to balance the circuits sufficiently for the higher frequencies of carrier transmission.

Fig. 36 shows the values of interference at different frequencies between two pairs of wires which are adjacent on the

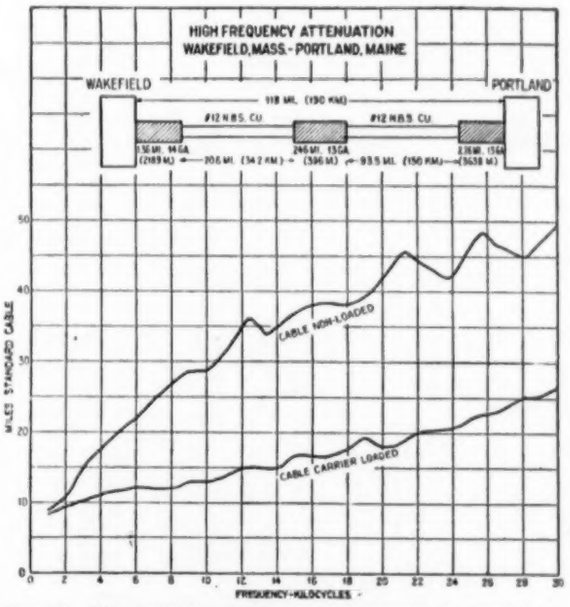

Fig. 34. Illustrations of Effect on Attenuation of Loading of Intermediate Lengths of Cable.

cross arm. Curve *A* shows typical values for circuits as measured with the ordinary telephone transpositions in them. Curve *B* indicates the great reduction made in

the cross talk by inserting transpositions in both of two circuits extending between Toledo, Ohio and South Bend, Ind., making the average number per circuit about six per mile. Inasmuch as these circuits are adjacent pairs on the line, the exposure between them is the maximum possible.

In Fig. 37, Curves *A* and *B* show, in the same manner, the cross talk between two circuits with the ordinary transpositions and after special transpositions had been cut into them. Here the circuits are not immediately adjacent but are separated on the cross arm by two other pairs of wires. The two pairs covered by this figure extend between Harrisburg and Pittsburgh, and are in commercial use for carrier systems.

As a result of a considerable amount of line measurements of the foregoing types with different transposition systems, and from theoretical investigation of cross talk at these frequencies, it has been determined that the interference limitations are roughly as follows:

Where carrier systems employ the same frequencies for transmission in the two directions, it would not be practicable to operate systems on all the pairs of a line, since the number of transpositions required would be prohibitively large. In fact, in a lead carrying a considerable number of circuits, the transpositions would have to be more closely spaced than are the poles under present standard construction.

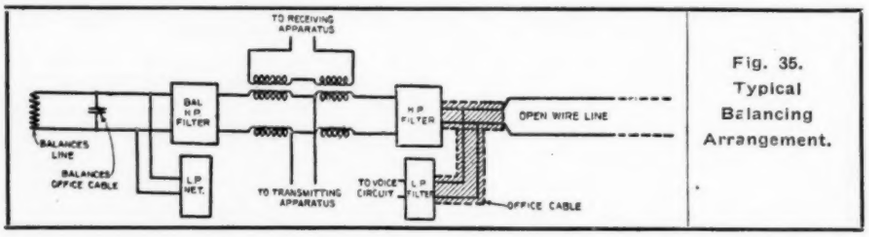

Fig. 35. Typical Balancing Arrangement.

It is possible, however, to reduce greatly the effect of interference between circuits, by employing systems using different frequencies in the two directions, and arranging so that all of the systems employ the same range of frequencies in each direction. This reduces, of course, the number of two-way channels which may be obtained per pair. It is not certain, however, that even with this arrangement of carrier systems it would be economical to apply carrier to all pairs of a pole line.

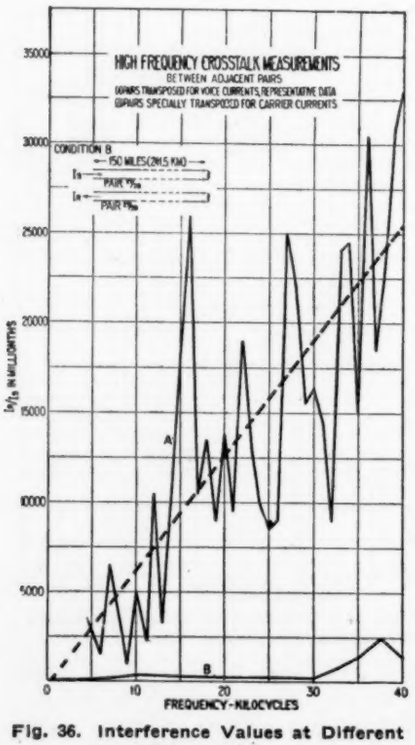

Fig. 36. Interference Values at Different Frequencies.

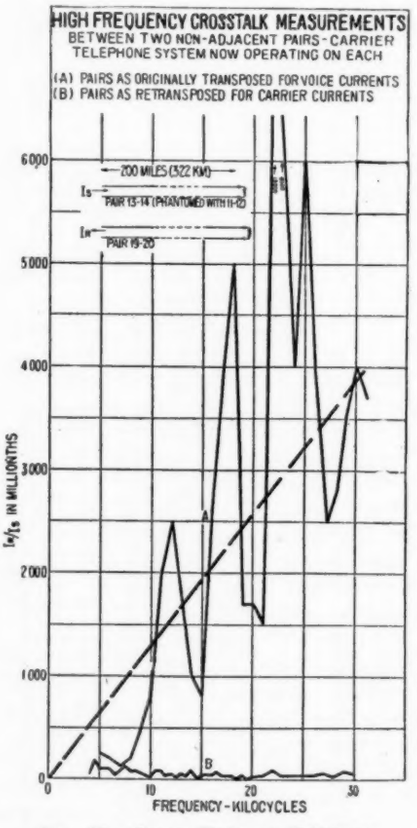
HIGH FREQUENCY CROSSTALK MEASUREMENTS
BETWEEN TWO NON-ADJACENT PAIRS - CARRIER TELEPHONE SYSTEM NOW OPERATING ON EACH
(A) PAIRS AS ORIGINALLY TRANSPOSED FOR VOICE CURRENTS
(B) PAIRS AS RETRANSPOSED FOR CARRIER CURRENTS
200 MILES (322 KM)
Is
PAIR 13-14 (PHANTOMED WITH 11-12)
In
PAIR 19-20
Ie/Is IN MILLIONTHS
FREQUENCY-KILOCYCLES

Fig. 37. Cross Talk at Different Frequencies.

Much has already been accomplished, however, in transposing a limited number of pairs on a pole line for carrier operation, and this constitutes the practical problem in most of the present cases; for example, two carrier telephone systems and one carrier telegraph system are operating over the same pole line in the section of the New York-Chicago line between Harrisburg and Pittsburgh, a distance of about 200 miles.

While the circuits involved in this case are not adjacent on the cross arm, the systems employ the same frequencies for transmission in opposite directions and, therefore, represent a severe condition as regards interference.

Noise Interference.

As the frequencies used in carrier systems are considerably higher than the harmonics which are generally present in power systems, these circuits are less subject to noise from power interference than are the ordinary telephone circuits. They are not free from such interference, however, since high frequencies may be set up in power systems by the charging of lightning protectors, switching, etc.

Since the circuits cannot in general be as well balanced to ground at carrier frequencies as at ordinary telephone frequencies, the carrier channels have shown a certain amount of interference from atmospheric electrical effects—that is, so-called static. Some interference has also been experienced from high-power long-distance radio systems which are now employing frequencies within the same range.

(To be continued.)

Home Company of LaGrande, Ore., to Have Modern Office.

By the first of November, the Home Independent Telephone Co., of LaGrande, Ore., expects to move into its new building and is planning to begin operation from that place with entirely new central office equipment of the most up-to-date and modern type. The company has placed an order for one of the latest types of switchboards with the Kellog Switchboard & Supply Co.

The central office equipment for this most modern telephone office will cost more than $25,000, it is stated. In addition to this an extensive constructive program affecting a large part of the city is being carried out in order to bring the distributing cables and wires into the new location and to provide the necessary facilities for rendering the proper service.

The outside construction work, including the alterations which will be made to the interior of the company's new building will cost around $20,000. It is estimated that the total expenditures of new capital necessary to make the move will be around $70,000.

In order to secure the necessary funds to carry on the extensive additions and improvements, the company plans to dispose of additional securities and to call a special stockholder's meeting at which it is the intention to increase the authorized capital stock of the company so that additional stock may be available to offer to the public.

Revised British Telephone Rates

Standpoint of British Postoffice Officials as to the Increased Telephone Rates—Excerpts from Article Written by Assistant Engineer in Chief and Published in Business Organization and Management—Various Charges Answered

"The remarkable press campaign which has followed the announcement that the postmaster-general has adopted the revised scale of telephone charges recently agreed to by a select committee of the House of Commons is in striking contrast to the equanimity with which the report of the departmental committee, which framed these charges, was received on its publication in June of last year.

It is no secret that the administrators of the post office anticipated a good deal of public opposition to the proposals on their first announcement, and are surprised that the storm has only burst, in unexampled fury, after these proposals have received the approval of a parliamentary committee appointed for the very purpose of assuring the public that the increased charges had not been arbitrarily imposed.

One cannot but sympathize with the harassed citizen who, after finding his expenses of all kinds soaring to the skies, looks upon the long deferred increase in the cost of his telephone as 'the last straw.' With the manner in which the subject has been treated by the press, one has less sympathy. . . . Plentiful space has been provided for the wildest exaggeration and the most obvious misrepresentation on the one side, while the few statements that have been made in defense of the post office have been very generally garbled or refused publication."

"The policy of the government is that the telephone system should be self-supporting; it should not be looked upon as a regular source of profit, contributing to the public revenue, neither should it be a financial burden upon the general taxpayer. Up to the time of the war, it fulfilled these conditions. After meeting all charges, direct and indirect, and paying the standard rate of interest on the capital sunk in the undertaking, it contributed to the exchequer a small annual balance, in the nature of a margin of safety. Revenue and expenditure were practically in equilibrium.

It is obvious that this equilibrium has been rudely upset by the great increase in costs of all kinds that has followed the war, and it should be common ground that a substantial increase in the payment made for the service is necessary to restore the balance.

Corresponding increases are being, or have been, made by telephone administrations all over the world. In many cases the proportion of increase is much higher than has been found necessary in this country.

The postmaster-general, in agreement with the government, deliberately abstained from proposing that an increase in telephone rates should closely follow the termination of hostilities. The revision now announced has been the subject of investigation in great detail by a departmental committee of accounting, engineering and commercial telephone experts, and, as already mentioned, the conclusions of this committee were concurred in, after careful consideration, by a select committee of the House of Commons, representing all political parties and with full powers to call evidence from all quarters."

"The new rates would bring in a revenue about 67 per cent higher than that produced, for the same amount of service, by the existing rates, which already include an increase of about 8 per cent made during the war. Compared with the strictly pre-war rates, the total increase is, therefore, about 80 per cent. The post office anticipates that this increase will lead to a reduction of traffic, without appreciable inconvenience to subscribers, which will probably reduce the theoretical revenue to an actual figure about 57 per cent in excess of the revenue at the old rates. These figures represent the average increases in the charges made to subscribers.

The post office has inherited a system of tariffs which is full of inequalities and which, but for the war, it would have attempted to simplify and remodel at an earlier date. The existing diverse charges have been built up, largely as matters of expediency, during the chequered career of telephone services in this country, which has resulted from the want of a settled policy on the part of successive governments.

The main alterations planned are: (1) The abolition of the "flat rate," a single, inclusive payment which covers the whole of the local telephone service required by a subscriber, i.e., it includes the installation and maintenance of his telephone line and instrument, and the operating and connecting of all calls which he originates. Only about 20 per cent of post office telephone subscribers are at present paying flat rates. The movement against the flat rate, on the part of telephone administrations, has been world wide, and has been specially directed towards its abolition in large business communities.

(2) The abolition of the "measured rate" which means a fixed minimum charge for the provision of the telephone, together with the right to originate a specified number of calls, and the sale, in advance, of additional calls in blocks, at a rate decreasing as the number of calls contracted for increases.

(3) The adoption of the "message rate," a uniform charge per originated call applying to all subscribers alike, and independent of any consideration of the total number of calls which each originates. This is considered to be the only system which can be equitably applied to the conditions in which the post office is carrying on the telephone business. The main charges fall in three portions —the installation, rental, the local message fee, and trunk fees.

"The favorite journalistic statement that a 'horde of new officials' will be required to enumerate the calls made by former flat rate subscribers is based upon complete misapprehension. More than 80 per cent of existing subscribers already pay in accordance with the number of calls they make. The electrical meters used for the purpose already exist on all the lines at large exchanges. . . . . The cost of regularly reading the meters and rendering accounts on the basis of calls to subscribers now on the flat rate will be insignificant in comparison with the additional revenue derived from the equitable system of charging for the service given.

The new tariff, it is stated, will help small users: (1) By making the large user pay the fair charge for the service he obtains, thus enabling the small user to be served at cost price; by abolishing the minimum charge for calls, whether used or not, by the system of quarterly instead of annual advance payments, which will reduce the initial outlay and spread the charge more evenly over the year.

Large users are pressing upon the postmaster-general the alternative of raising the necessary additional revenue by making a uniform percentage increase on all the present charges. Such a course would enable these large users to continue to receive service at the cost of other people who would pay more than their fair share.

In conclusion the post office says: "The proposed increases in rates compare favorably with those which other administrations abroad are being forced to adopt, and compare favorably with the great increase in expenses of all kinds which has fallen upon the telephone organization."

Sundry Snapshots Along the Trail

Observations and Comments, Pertinent and Otherwise, On the Sunshine and Shadows of Telephone Work

By Well Clay

Great honor is due the surgeons,
With their sharp and shiny knives,
Who carve our poor anatomies
To save our precious lives.

But when the surgeons are finished,
With our forms full of ether fumes,
All bandaged and taped to the limit,
We're bundled off to our rooms.

Then begins the battle in earnest,
With which surgeons have little to do;
When we're left in charge of the nurses
Whose job is to pull us through.

They hover over us when we waken,
Watching each symptom with care;
Wetting our parched tongues with water,
Smoothing our tumbled hair.

They count the fast beat of our pulses,
Noting if fever arise;
Turning with draw sheet to rest us,
Watching for jaundiced eyes.

This is the job of the nurses,
Neat in their uniforms white,
As they watch our changing conditions,
Morning and noon and night.

All honors we say to the surgeons,
For the wonderful things they do,
But don't let's forget it's the nurses
That finally pull us through.

A job which is somewhat similar to a nurse's job is that of the manager of a telephone system which has just undergone the experience of a reconstruction, reorganization, re-promotion period at the hands of some specialized expert in this line; who has operated on the plant and its organization. After the plant has been torn apart and rebuilt, the book accounts rearranged and made to fit the new order of things and the rates readjusted to harmonize with the reincarnation, then the plant is turned over to the care of the man who is to manage it. To him is delegated the job of pulling the scheme through to success.

Like the nurse, he must know, to begin with, the previous history of the patient, as far as possible, the nature of the operation which has just been performed, and the orders of the doctor in charge. Then begins the real fight and the real test. From then on, night and day, in season and out, the manager must be on the job and be wide awake to all the multitude of changes which may take place in the life of the business if he is to make it turn out at all successfully.

To him is delegated the job of giving satisfactory service, keeping up the plant to a high state of efficiency and collecting the revenues which have been prescribed as correct and sufficient. That this is not always an easy job is evident, for in many communities the public do not agree with the commissioners or whoever makes the rates, that they are fair and equitable. Just as the fevered patient wishes to regain his health without taking bitter medicines so also do the public, in many cases, desire good service without taking what they deem a bitter pill of too high prices therefor. The manager must be diplomatic enough to put matters in such a light to the public that they will accept the dose with good grace and faith.

The Manager's Job Is Like the Nurse's.

The period through which the telephone business is passing just now is, to many companies, a period of hospital experience. It was brought about by years of run-down and neglected conditions, during which insufficient rates were the excuse for not keeping the system toned up and in a healthful condition. In many cases, a large percentage of the book values of the plant have had to be amputated and new values substituted in their stead which caused stockholders much financial pain.

Perhaps, new parts have had to be placed instead of old and wornout ones, at a great expense. The result is a doctor's bill the public must pay if they want full return to efficiency once more. Many plants have been left to deteriorate, waiting for something to happen which would make rate raising easier, before anything was attempted. The result always is as could be expected—the doctor must be called in when the patient is least able to withstand the shock of an operation and totally unable to pay the bill, without outside financial assistance.

Such a Case Always Means a Long Struggle for the Nurse.

Such a case always means a long struggle for the nurses and poor pay for their services at best. Were it not for professional pride, we fear that many nurses would let some patients go under, whom they deemed already doomed, rather than work at a poorly paid and seemingly thankless job. However, to their credit be it said that they never do.

Perhaps, part of the pay comes when the nurses see the patient begin to take a turn for the better and to improve daily. Then it is that the value of their services is proven and their faith and watchfulness justified. To have nursed a patient back from the shadows of dissolution is a great achievement and one of which any nurse may feel proud.

How many telephone patients just now are in sad need, not only of surgical aid but of competent and careful nursing on a more suitable financial diet that they may regain that state of health necessary if they are to be able to serve the world in a suitable manner once more. While it is true that there are available proper rules for nursing telephone plants which can be had easily yet it is the personality, resourcefulness, constancy and care of the nurses which accomplish the final successful result.

APHORISM: A good nurse is more to be desired than much medicine.

Commissions, Courts and Councils

Discussion and Rulings of State Bodies Having Supervision Over Telephone Companies—Decisions of Courts in Matters of Interest to Public Utilities and Actions of City Councils Relative to Franchise, Rates and Service

Indiana Association to Investigate Boycott at Angola.

Intimation that federal court action may be invoked against the boycott system insofar as it relates to telephone companies in Indiana was given recently in a statement issued by the Indiana Telephone Association in regard to a situation now confronting the Steuben County Telephone Co. at Angola.

"The officers and directors of the Indiana Telephone Association," the statement says, "are making a thorough investigation of the Angola situation with reference to the concerted movement in a boycott of the Steuben County Telephone Co.

"Boycotting as a principle is prohibited by the federal law, and those participating are individually subject to heavy penalty, as was proven in the Danbury hat case and the Buck stove case, which attracted national attention. If the same principle is involved in this case, the association feels that it is its duty to protect American business from such unfair method as boycotting."

The Steuben County situation, which is somewhat typical of a number of situations in the state, began when the Indiana Public Service Commission, last year, issued an order authorizing the company to increase its rates at its eight exchanges in the county. The business rate was increased from $1.90 to $3.25; residence from $1.40 to $2; rural from $1.15 to $1.50 for residence and $2.25 for business; and secondary rates increased somewhat similarly. They were to go into effect on October 1.

However, more than 1,600 of the 2,800 subscribers of the company signed a petition in which there was a "solemn vow," according to a representation of the company to the commission, not to continue as subscribers if the increased rates became effective. On the strength of the representation and on petition of the company, the commission named April 1 to replace the October date for the new rates to take effect.

The time arrived and the new rates went into effect. According to information received at the Indiana Telephone Association's headquarters more than 1,000 telephones have been ordered out, and between 600 and 700 actually have been taken out. It was then the association decided to take a hand and find out whether the federal anti-boycott laws have been violated.

Many rural telephone systems in Indiana have been seriously affected by boycotts when rates were increased, and the members of the commission have recognized the situation as a difficult one. The Steuben County company reports that it has been losing $1,000 a month on account of the delay in putting the new rates into effect. The outcome of the present case is being watched with interest by telephone men all over the state.

Indiana Company Asks Authority to Increase Rural Rates.

Authority to increase its rural telephone rates to $1.50 a month is requested in a petition that has been filed with the Indiana Public Service Commission by the Southern Indiana Telephone & Telegraph Co. The petition would affect Brownstown, Vallonia, Tampico and Crothersville.

The company requests that the lines owned by subscribers and connected with its lines be made into metallic circuit systems and that when this has been done, it be authorized to pay a rental of 25 cents a month to each subscriber who owns his own instrument and to each who owns his own line. The company asks to work out agreements whereby it may acquire lines and instruments owned by subscribers.

Local and Rural Rate Increase Granted Minnesota Company.

Permission to increase its net monthly rates on May 1 was granted the Kennedy Telephone Co., of Kennedy, Minn., by the state railroad and warehouse commission on April 23. Here are the old and new rates:

	Old	New
Individual line business	$2.00	$2.25
Extension station business	...	.50
Individual line residence	1.25	1.50
Extension station residence	...	.50
Rural multi-party	1.25	1.50
Extension bells	...	.25

The Kennedy Telephone Co. serves approximately 63 town and 129 rural stations.

Kansas District Court Overrules Motion to Delay Rate Raise.

Judge James A. McClure of the Kansas District Court has overruled the state public utilities commission's motion asking for an additional 30 days' stay of execution before the temporary injunction recently obtained by the Southwestern Bell Telephone Co. goes into effect.

Judge McClure's ruling will give the telephone company the power to install its own rates at Winfield, Lyons, Arkansas City, El Dorado, Atchinson and Hutchinson until the rate cases are passed upon by the public utilities commission. The injunction enjoins the commission from interfering with the company while the company's own rates are in effect.

The commission's motion for an additional stay of execution was made to prevent the telephone company installing its own rates before the rate hearings came up before the commission May 23. An additional 30 days' stay of execution would have given the commission three days to pass upon the rate cases before the injunction would have gone into effect.

Judge McClure made a special provision in his ruling at the hearing in March for protecting the subscribers from any excessive rate the telephone company might charge when the injunction goes into effect. The telephone company was placed under a large bond to make a refund to the subscribers if its own rates are higher than the rates found reasonable by the public utilities commission.

Mexican Company to Improve and Extend Its Properties.

An investigation of the telephone situation in Tampico, Mexico, has just been made by Ricardo E. Berg, superintendent of the plant of the Compania Telefonica y Telegrafica Mexicana in the city of Mexico, and Gustave T. Trevino, who holds a similar position in Monterey, the purpose of their survey being to determine whether the company should extend its long distance lines to Tampico and install a telephone system.

They found conditions favorable for the proposed improvement, it is stated, and application will soon be made by the company for a local franchise.

The Mexican Telephone & Telegraph Co., as it is known to Americans, has been operating in Mexico for many years, and it now contemplates making many improvements and extensions to its properties. The company's principal office is in Boston, Mass.

Higher Rates and Miscellaneous Charges Approved.

The Argyle Telephone Co., a co-partnership, serving approximately 188 town and 194 rural stations and performing a switching service for 69 connecting line rural stations, at Argyle, was authorized by the Minnesota Railroad & Ware-

Make Every Exchange Self-Sustaining With Strowger Equipment

Please tell the Advertiser you saw his advertisement in TELEPHONY.

WHEN commission rulings and public pressure compel a telephone operating company to give their subscribers at outlying exchanges the same adequate, continuous service that their city subscribers enjoy, it usually means the paying out of more than the entire revenue of such exchanges in increased operating expense.

To cover entirely the losses thus incurred from the profits of the city exchange is not always possible. The net profits of the entire system are thus either reduced to a low point or eliminated entirely.

The Community Automatic Exchange (C. A. X.) is specially designed to meet such conditions. Rendering uniformly excellent service 24 hours a day without attention (except for maintenance at infrequent intervals) the C. A. X. not only sets service standards far above the requirements of any regulating bodies, but also puts each exchange permanently on a paying basis.

The experience of those companies that have installed C. A. X. equipment in one or more of their outlying exchanges, invariably prompts them to extend its use to other points.

We will be glad to show how the C. A. X. will place your small exchanges on a paying basis.

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Kansas City
1001 New York Life Bldg.

ASSOCIATED COMPANIES:

INTERNATIONAL TELEPHONE SALES AND ENGINEERING CORPORATION, New York
International Automatic Telephone Company, Ltd., London
Compagnie Francaise pour l'Exploitation des Procédés
Thomson-Houston, Paris
Automatic Telephone Mfg. Co., Ltd., Liverpool. Automatic Telephones, Australasia, Ltd., Sydney.

house Commission on April 23 to increase its rates and establish service connection and other miscellaneous charges. The old and new net monthly rates are as follows:

	Old.	New.
Individual line business	$2.00	$2.50
Extension station business	.50	1.00
Individual line residence	1.25	1.50
Two-party line residence	...	1.25
Extension station residence	...	.75
Rural multi-party	1.25	1.50
Rural switching charge	.35	.35
Extension bells	...	.25

Service Connection Charges.

	Business Stations	Residence Stations	Extension Stations
Instrument not in place	$2.00	$1.50	$1.00
Instrument in place	1.50	1.00	*

*No charge.

Temporary Increase in Rates in Buchanan County, Mo.

A temporary increase in rates was granted the Buchanan County Mutual Telephone Co., of DeKalb, Mo., by the state public service commission on April 14, to become effective May 1. The new rates are to remain in effect for 13 months and compare with the old as follows:

	Old	New
Direct line business	$21.00	$23.00
Direct line residence	14.40	21.00
Rural or Farm Line Service.		
Class B service:		
Business subscribers	21.00	33.00
Residence subscribers	14.40	21.00
Class D service:		
Business subscribers	12.00	30.00
Residence subscribers	9.00	18.00
Toll message to St. Joseph	....	.10
Toll message to Dearborn	....	.10
Additional charge for desk set equipment, business or residence	3.00	3.00
Business extension sets	12.00	12.00

Rentals due and payable quarterly in advance.

Discount of 25 cents per month allowed if bill is paid by the 20th of the first month of the current quarter.

Nebraska Company Given Temporary Rates Pending Valuation.

The Nebraska state railway commission has given the Campbell Telephone Co. permission to charge the following rates: Individual business, $2; party business, $1.75; residence, $1.50; party residence and rural, $1.40; where non-stockholder owns sets, business, $1.60; residence and rural, $1; where stockholder owns sets, individual business, $1.60; party business, $1.35; individual residence, $1.20; party residence and rural, $1.

The company serves 352 subscribers. The commission made no valuation of the plant, but makes the rates temporary until such time as it can have the plant gone over by its engineers, after which a hearing will be held at Campbell and a permanent and stable policy for the company developed. It says that it is essential that it be preserved as an Independent telephone company, but that it is evident that it has been operating under insufficient rates, running from 50 cents to $1.25 a month.

The company has had to assess stockholders $10 a share, and now faces rebuilding with depreciation gone, a situation that makes impossible the selling of stock to those getting its service. In lieu of dividends, the stockholders will be allowed a rebate of 10 per cent of the face value of the stock.

Another Nebraska Company Asks for Reduction of Rates.

The Arnold Telephone Co. is the second Nebraska corporation to ask the state railway commission for permission to reduce rates. It asks that switching rates be reduced from $5 a year to 35 cents a month and that party residence rates be fixed at $1.20, $1.10 and $1.00 respectively. The decrease will reduce the annual revenues by $400.

The annual report of the company shows a surplus from operations for the past year of $1,008, about 20 per cent of the total revenues, after payment of 8 per cent dividends on $4,500 stock. The company pays but a nominal sum to its officers and manager.

Bloomfield (Neb.) Subscribers Threaten With New Company.

Being without telephone service for seven weeks has not tamed the spirit of the striking patrons of the Union Telephone Co. at its Bloomfield (Neb.) exchange. At a mass meeting at which representatives of the company attended, the patrons voted unanimously to continue to refuse to pay the 23 per cent added rates recently authorized by the Nebraska State Railway Commission.

A resolution was adopted giving the company 30 days in which to secure permission of the railway commission to reduce rates to the old standard, and it was also provided therein that if the company concedes this, it must also give free service to Center, the county seat, and must not make any charge for reconnections of the 650 telephones cut off by the subscribers themselves. If the company does not comply with these demands, steps will be taken to organize a local company to build an exchange at Bloomfield.

The commission is sitting tight on its position that it is idle for the company to ask for a reduction to the old rates unless it can show good reasons why the commission should rescind its recent action. The commissioners do not think much of the threat to erect a local exchange.

Within the last year an exchange was erected at Venango, a new live town, which cost $200 a station, and although the rates are as high as the traffic will bear, they are insufficient. The valuation placed on the Bloomfield exchange, upon which the protested rates are based, is a third of that figure.

Bloomfield citizens are claiming that the city ordinance limiting rates does not permit the increase, but in the hearing the commission held that the ordinance had nothing to do with the matter under state regulation.

Higher Rate Schedule and Service Charges Specified.

On May 1 telephone rates were increased in the towns of Canova and Roswell, S. Dak., under an order issued April 21 by the South Dakota Railroad Commission granting the necessary permission to the Peoples Telephone Co. The company serves 128 subscribers at is Roswell exchange and 153 at its Canova exchange. The old and new rates and the service connection charges approved are:

	Old.	New.
Main line, business, wall type	$1.50	$2.25
Main line, residence, wall type	1.00	1.50
Rural party line	1.00	1.40
Desk sets extra		.25
Extension sets		1.00
Extension bells		.25
Rural switching per year		2.50

	Business—Instrument In place.	Business—Instrument Not in place.
Exchange, main or party line station	$1.00	$2.00

	Residence—Instrument In place.	Residence—Instrument Not in place.
Exchange, main or party line station	$1.00	$1.50
Rural station	1.00	1.50

Inside Moves Within Same Room or Premises.

Business or residence stations.....$1.00

Changes in type of equipment.

Business or residence $1.00

At the hearing considerable testimony was presented by representatives of connecting companies with reference to the payment of switching charges, protesting against the imposition of a toll charge on messages interchanged with subscribers on lines owned by other companies and not located in the exchange area of the Peoples company nor connected with its exchanges upon a switching basis.

It was also contended that certain subscribers of the Vermillion Telephone Co.'s lines require service with individual subscribers of the farm line company located beyond Unityville, and that such service should be provided free. In its opinion the commission finds that the company's policy in establishing rates for switching service is in accordance with the statute and rules in effect covering switching of rural lines at exchanges in the state, and approved a rate of $3 per year for rural lines being switched at the exchange only, a rate of

$2.25 per year for rural lines having direct connection with or receiving switching service at two exchanges, and a rate of $1.50 per year additional for any line connected with one exchange only, but so located that the subscribers require a second exchange service.

No valuation of the company's property was made, the commission finding that the company's claimed valuation exceeded the average value of other telephone companies in the state operated under similar conditions by nearly 100 per cent.

This large difference in value is accounted for by the installation of a large amount of underground construction in Canova and by the further fact that considerable rebuilding and replacement of lines and equipment was performed during the period of high costs.

Subscribers Advise New York Company to Raise Rates.

The board of directors of the Hammondsport (N. Y.) Telephone Co. has voted to increase the telephone rates as follows: Residence from $12 to $18 per year, business rates from $15 to $24 per year, private lines from $24 to $36 per year.

At the present time the telephone company does not pay dividends, but has maintained satisfactory service. The proposed rates are said to be lower than those charged in most towns of this size.

A petition was circulated and signed by a big majority of present telephone users advising the increase, when all the facts in relation to the maintenance of the local exchange were brought to their attention.

Rate Increase in Dallas, Texas, Upheld by Circuit Court.

The decision of Judge James C. Wilson, of the United States District Court for the Northern District of Texas, which permitted the Dallas Telephone Co. to put into effect its present schedule of rates on an injunction, has been affirmed by the United States Circuit Court of Appeals at New Orleans, La. It is understood the city of Dallas will apply for a rehearing of the case, and if denied by the circuit court, an appeal will be taken to the United States Supreme Court.

In his decision Judge Wilson held that the old schedule of rates charged by the company, as set by the city, was confiscatory and a temporary injunction was granted in which the company put into effect $4 for residence and $10 per month for business telephones.

The city took appeal to the circuit court of New Orleans on a writ of error, alleging that Judge Wilson was without power in granting the injunction and should have called two other federal judges to act with him in rendering a decision.

Wisconsin Farmers Mutual Company Gets Higher Rates.

The Utica Farmers Mutual Telephone Co. was given permission to increase its rates by the Wisconsin Railroad Commission on April 30. The new rates which became effective May 1, are $1.25 per month for residence subscribers and $2 per month for business subscribers.

Subscribers who own and maintain their own telephones are allowed a rental of 25 cents per month. The old rates were in the nature of an assessment levied by the owners and subscribers, $9 per year being paid to the general company, and local assessment paid to the local divisions varied from $3 to $6 per year.

The upkeep and repair of the lines under a system of contribution of labor has led to lax conditions both in operation and upkeep, and has been the cause of considerable dissatisfaction to persons who are subscribers but not stockholders. A uniform rate for subscribers who own their own telephones and for those who do not will probably cover all of the situations that have arisen in the matter of operation of the system.

The gross income of the company for the year of 1920 was not sufficient to meet the entire operating expenses and the company was obliged to borrow $550, and was compelled to take out of its surplus a considerable sum of money to provide for the upkeep and operating expenses of the system for that year.

Rates Raised—Subscribers Demand Improved Service.

The Wisconsin Railroad Commission on April 30, granted permission to the Morris Telephone Co., of Bowler, to increase its rates. The new rates, which became effective May 1, compare with the old as follows:

	Old	New
Business single-party	$1.75	$2.25
Business rural multi-party	1.50	1.75
Residence single-party	1.25	1.75
Residence rural multi-party	1.00	1.50

Subscribers furnish their own instruments which are kept in repair and maintained by the company. The individual subscribers have been required to furnish the necessary batteries, but under the new rates the company will furnish the batteries. A penalty of 15 cents may be assessed if rentals are not paid on or before the 15th of the current month, and service discontinued if not paid by the end of the month.

The Morris Telephone Co. is a rural company serving 37 subscribers in the village of Bowler, and the rural territory between Bowler and Tigerton.

The service of the company has not been satisfactory in the past. It is claimed by the subscribers that the officers have not done the necessary repair and maintenance work. No objection is made to increase rates but a demand for improved service is made.

The total operating revenues, for the year ending December 31, 1920, were $1,474.28, and the total operating expenses were $1,977.02, leaving an operating deficit of $502.74. The cost of the plant is about $1,200.

Forestville (Wis.) Company Authorized to Issue Stock.

The Wisconsin Railroad Commission on April 18 authorized the Forestville Telephone Co., of Forestville, to issue 100 shares of its common stock of the par value of $25 per share making a total issue of $2,500 for the purpose of bringing the total of its outstanding stock, bonds, notes and other evidences of indebtedness more nearly to an equality with the value of its property.

The commission found that the value of the company's property for the purposes of this proceeding was $13,000. This stock is to be distributed equally, share for share, among the holders of the stock of the corporation now outstanding.

Necedah (Wis.) Telephone Co. Increases Rates.

Monthly rates of the Necedah Telephone Co., serving 127 subscribers, increased May 1, under an order issued April 30 by the Wisconsin Railroad Commission. The old rates compare with the new as follows:

	Old	New
Business single-party	$1.75	$2.65
Business two-party	1.50	2.40
Residence single-party	1.35	1.65
Residence two-party	1.15	1.40
Switching service, per year	5.00	5.00

The operating revenues for the year ending December 31, 1920, were $3,365.31, while the operating expenses were $3,232.99, leaving available for depreciation and return $132.32. The value of the property is about $6,500.

No Provision for Depreciation Reserve—New Rates.

The Crawford County Farmers Mutual Telephone Co. was given permission by the Wisconsin Railroad Commission to increase its rates from $12 flat rate for all telephone users to $1.25 per month for residence users and $2 per month for business telephones. Persons maintaining and owning their own telephones will be paid a rental of 25 cents per month.

The company has never paid any dividends, and no depreciation reserve has been made. The effort has been only to meet the cost of operation. Consequently, the lines have deteriorated and depreciation has increased. The system as a whole has been the cause of considerable complaint and disposition on the part of some of its component units to withdraw from the general company.

Company.	Town or City.	Population.	Total No. of telephones.	Type of equipment.	Net rate per annum: 1-party business.	2-party business.	1-party residence.	2-party residence.	4-party residence.	Rural business.	Rural residence.	Rural switching.
Chicago, Ill. (See Jan. 1 issue, page 24.)	Chicago	2,547,201	...	C. B.	$48.00†‡	.....	$45.00†	$33.00†	.....	$.....	$.....	$.....
	...	...			72.00‡	54.00‡	.....	45.00‡	32.40‡	.....	.....	.....
South Atlantic, Fla.	Miami Beach	15,592	...	C. B.	66.00*	.....	39.00*	33.00*	27.00*	.....	.....	.....
Eldorado, Ill.	Eldorado	3,366	709	Mag.	27.00	24.00	18.00	15.00	12.00	18.00	12.00	.....
Central, Ill.	Paxton	2,912	...	.....	36.00	.....	27.00	24.00	.....	.....	18.00	12.00
Dixon Home, Ill.	Dixon	7,216	2,800	Mag. and C. B.	48.00	42.00	30.00	24.00	21.00	.....	21.00	.....
Pike County, Ill.	Barry	1,647	...	Mag.	24.00	18.00	18.00	.....	15.00	.....	15.00	6.00
Browerville, Minn.	Browerville	633	107	Mag.	27.00	24.00	18.00	15.00	.....	.....	.....	4.20
Garfield Farmers' & Merchants', Minn.	Garfield	...	...	.....	27.00	.....	18.00	.....	.....	.....	18.00[1]	.....
	Brandon	276	787	C. B.	.....	.....	.....	.....	.....	.....	15.00[2]	.....
	Evansville	389	...	.....								
Farmers' Mutual, Minn.	Cerro Gordo	50	292	.....	.....	.....	.....	.....	.....	.....	18.00[1]	.....
					.....	.....	.....	.....	.....	.....	15.00[2]	.....
Tri-County, Mo.	Nelson	480	...	Mag.	30.00*	.....	21.00*	.....	.....	.....	.....	.....
Liberty, Mo.	N. Kansas City	1,000	...	.....	120.00	102.00	57.00	42.00	.....	.....	.....	.....
Ravenna, Neb.	Ravenna	250	537	.....	36.00[1]	30.00	21.00[1]	18.00	.....	.....	24.00	.....
					30.00[2]	.....	18.00[2]	.....	.....	.....	18.00	.....
Arcadia Electric Light, Nebr.	Arcadia	618	...	Mag.	24.00[1]	.....	15.00	13.80	.....	.....	15.00	4.00
Subscribers' Service, N. Y.	Woodbridge	900	...	.....	48.00	39.00	39.00	33.00	27.00	39.00	27.00	.....
Brinsmade, N. D.	Brinsmade	154	217	Mag.	33.00	.....	18.00	.....	.....	.....	24.00	.....
Stanley, N. D.	Stanley	653	230	.....	39.00*	.....	27.00*	.....	.....	.....	.....	.....
Spencer, S. D.	Spencer	572	276	.....	24.00	.....	13.20	.....	.....	.....	15.00	.....
La Crosse, Wis.	La Crosse	31,833	1,300	C. B. and Mag.	48.00	42.00	30.00	24.00	24.00	.....	.....	.....
	Onalaska	1,146	...									
	Omro	1,285	...	.....								
	West Bend	2,462	...	.....	36.00	30.00	24.00	21.00	18.00	.....	24.00	7.50
	Wrightstown	525	...	.....								
	S. Milwaukee	6,092	...	.....	42.00	36.00	24.00	21.00	18.00	.....	24.00	7.50
	De Pere	4,477	...	.....	48.00	42.00	27.00	24.00	21.00	.....	24.00	7.50
Wisconsin, Wis.	Racine	47,465	...	.....	66.00	54.00	36.00	30.00	24.00	.....	27.00	9.00
	Oshkosh	36,549	...	.....								
	Appleton	18,005	...	.....	54.00	42.00	30.00	24.00	21.00	.....	27.00	9.00
	Beloit	18,547	...	.....								
	Fond du Lac	21,486	...	.....								
	Kenosha	32,833	...	.....	54.00	42.00	30.00	27.00	24.00	.....	27.00	9.00
	Green Bay	30,017	...	.....								
McKinley, Wis.	McKinley	...	424	.....	.....	.....	.....	.....	.....	.....	18.00	.....
Gleason, Wis.	Gleason	100	93	Mag.	24.00	.....	21.00	.....	.....	.....	21.00	.....
Central Union, Ill.	Gilman	1,305	345	.....	39.00	33.00	24.00	.....	21.00	.....	.....	6.00
	Onarga	1,273	...	.....								
Home, Ill.	Cairo	15,995	...	Mag. and C. B.	48.00	42.00	24.00	21.00	18.00	.....	.....	.....
	Mounds	1,686	2,389		36.00	30.00	24.00	18.00	.....	.....	24.00	.....
	Mound City	2,837	...		36.00	27.00	24.00	18.00	.....	.....	.....	.....
Abingdon Home, Ill.	Abingdon	2,464	...	Mag. and C. B.	33.00	.....	24.00	.....	19.80	27.00	19.80	.....
	London Mills	555	930									
Sullivan Home, Ill.	Sullivan	2,621	...	Mag.	24.00	.....	21.00	.....	18.00	.....	19.80	.....
Avon, Ill.	Avon	865	...	Mag.	39.00*	36.00*	30.00*	27.00*	24.00*	.....	.....	.....
					24.00	.....	18.00	.....	15.00	.....	18.00[1]	.....
					.....	.....	.....	.....	.....	.....	15.00[2]	.....
Peninsular, Fla.	Tampa	56,251	...	C. B. and Auto.	66.00	51.00	39.00	30.00	24.00	.....	.....	.....
Fairfield Farmers' Co-op., Minn.	Holloway	215	147	Mag.	15.00	.....	19.00	.....	.....	.....	18.00[1]	.....
					.....	.....	.....	.....	.....	.....	15.00[2]	.....
Kansas City, Mo.	Fairmont	200	...	.....	54.00*	.....	27.00*	24.00*	21.00*	30.00*	24.00*	.....
Brocket Farmers', N. Dak.	Brocket	214	264	Mag.	36.00	.....	24.00	.....	.....	.....	30.00	.....
Lidgerwood Rural, N. D.	Lidgerwood	1,127	...	Mag.	36.00*	.....	21.00*	.....	18.00*	.....	21.00*	.....
	Genesco	280	...	.....	.....	.....	.....	.....	.....	30.00	21.00	.....
	Petersburg	357	...	.....								
Tri-County, N. D.	Niagara	132	426	Mag.	36.00	.....	21.00	.....	.....	.....	24.00	.....
	Dahlen	...	...	.....								
Cavalier, N. D.	Cavalier	773	204	Mag.	36.00*	.....	21.00*	.....	.....	.....	27.00*	.....
Farmers', N. D.	Starkweather	262	232	Mag.	36.00*	.....	21.00*	.....	.....	.....	15.00*	.....
	Hampden	425	35	.....								
Greaves, N. D.	Kenmare	1,533	...	.....	36.00	30.00	21.00*	18.00*	.....	.....	24.00*	.....
	Tolley	306	719	Mag.								
	Coteau	525	...	.....								
Armour, S. D.	Armour	353	496	Mag.	27.00*	21.00*	18.00*	.....	15.00*	.....	15.00*	.....
Winfred, S. D.	Winfred	301	65	Mag.	27.00	.....	18.00	.....	15.00	.....	.....	.....
C. A. Bradford's, Ore.	Prairie City	348	...	.....	42.00	36.00	27.00*	.....	21.00*	.....	.....	3.00
Bryan, Texas.	Bryan	4,132	...	.....	48.00	.....	30.00	.....	.....	.....	.....	.....
Farmers', Wis.	Beetown	112	...	.....	105.00	94.20	94.20	87.00	69.00	94.20	76.20	3.00
	Lancaster	2,329	...	.....								
	Glen Haven	325	...	.....								
	Cassville	890	2,153	Mag.								
	Potosi	464	...	.....								
	Hurricane	78	...	.....								
	Bloomington	620	...	.....								
	Bagley	375	...	.....								
Junction City Rural, Wis.	Junction City	...	...	Mag.	30.00	24.00	30.00	24.00	.....	.....	18.00	.....
Wisconsin, Wis.	Waupaca	2,789	...	.....	42.00	36.00	24.00	21.00	19.80	.....	24.00	7.50
	Green Lake	563	...	.....	36.00	30.00	24.00	21.00	18.00	.....	24.00	7.50
	Mazomanie	917	...	.....	36.00	30.00	24.00	21.00	18.00	.....	24.00	.....
Deerfield, Wis.	Deerfield	533	302	Mag.	.....	.....	.....	.....	.....	24.00[1]	21.00[1]	.....
					.....	.....	.....	.....	.....	21.00[2]	18.00[2]	.....
East Florida, Fla.	Dunnellon	979	...	.....	39.00*	.....	24.00*	.....	.....	.....	.....	.....
Mooresville, N. C.	Mooresville	3,400	...	.....	39.00*	33.00*	27.00*	24.00*	18.00*	.....	.....	.....
Virden Home, Ill.	Virden	4,000	701	Mag. and C. B.	39.00	33.00	27.00	24.00	21.00	30.00	24.00	.....
Central Union, Ill.	Quincy	36,382	...	.....	69.00	57.00	33.00	27.00	.....	33.00	24.00	.....
Chesterfield, Ill.	Medora	444	306	Mag.	24.00	.....	16.80	.....	.....	.....	15.00	.....
Atwood Mutual, Ill.	Atwood	659	745	Mag.	24.00	.....	21.00	.....	.....	.....	21.00	.....
	Hammond	492	...	.....								
Central Union, Ill.	Centralia	11,838	...	.....	63.00	54.00	33.00	27.00	.....	.....	27.00	.....
	Central City	287	2,718	.....								
	Womac	150	...	.....								
Illinois Bell, Ill.	Alexander	200	...	.....	36.00	.....	21.00	.....	18.00	27.00	21.00	.....
	Literberry	80	1,109	.....	.....	.....	.....	.....	18.00	.....	21.00	.....
	Lewistown	2,312	...	.....	39.00	33.00	30.00	24.00	21.00	.....	24.00	6.00
Potomac, Ill.	Armstrong	290	...	.....	33.00	.....	18.00	.....	.....	.....	21.00	.....
	Collison	200	571	Mag.								
	Potomac	764	...	.....								
Pittsfield, Ill.	Pittsfield	2,095	609	C. B.	27.00*	.....	18.00*	.....	15.00*	.....	.....	.....
Breckenridge, Minn.	Breckenridge	1,840	605	Mag. and C. B.	33.00	30.00	21.00	18.00	.....	.....	18.00	4.20

Texas County, Mo.	Houston	644	276	.....	30.00*	.....	18.00*	12.00*	.....	.....	.....	.....
	Licking	351	294	Mag.	18.00*	.....	12.00*	9.00*	.....	.....	.....	.....
	Cabool	789	389	.....	30.00*	.....	18.00*	12.00*	9.00*	.....	.....	.....
La Belle Constr., Mo.	La Belle	1,017	...	Mag.	21.00*	21.00*	15.00*	15.00*	.....	.....	.....	.....
	Newark	217	...	.....								
Knox City, Mo.	Knox City	395	...	Mag.	21.00*	21.00*	15.00*	15.00*	.....	.....	.....	.....
Farmers' Union, Nebr.	Winnetoon	220	425	Mag. and C. B.	24.00	.....	18.00	.....	.....	.....	18.00	.....
Park River, N. D.	Park River	1,074	298	Mag.	39.00	.....	24.00	.....	.....	.....	27.00	.....
Buffalo, N. D.	Buffalo	241	176	Mag.	39.00*	.....	24.00*	.....	.....	.....	27.00*	.....
Urban, N. D.	Bowbells	639	113	.....	36.00	.....	21.00*	.....	.....	.....	.....	.....
Drayton, N. D.	Drayton	649	524	Mag.	30.00	.....	18.00	.....	.....	.....	.....	.....
	Bowesmont	200	...	.....								
Yale, Okla.	Yale	685	...	Mag.	48.00	.....	27.00	.....	24.00	.....	24.00	6.00
Kingfisher, Okla.	Kingfisher	2,538	...	Mag.	36.00	.....	21.00	.....	18.00	.....	.....	6.00
Mangum, Okla.	Mangum	3,667	560	Mag. and C. B.	42.00	.....	24.00	.....	.....	.....	18.00	6.00
Malheur Home, Ore.	Ontario	1,248	...	Mag.								
	Nyssa	449	860	and	48.00*	42.00*	27.00*	24.00*	21.00*	.....	.....	.....
	Vale	992	...	C. B.								
Calapooia, Ore.	Sutherlin	...	95	Mag.	30.00*	24.00*	24.00*	21.00*	18.00*	.....	.....	3.00
Gary, S. D.	Gary	591	323	Mag.	24.00	.....	18.00	.....	.....	.....	16.80	.....
Farmers' Lake Shore, Wis.	Algoma	2,082	66	Mag.	24.00	.....	19.80	.....	.....	.....	.....	.....
La Fayette County, Wis.	Gratiot	368	...	Mag.	27.00	.....	21.00	.....	18.00	.....	21.00	7.50
	Wiota	119	...	.....	27.00	.....	21.00	.....	18.00	.....	21.00	9.00
Goodrich, Wis.	Goodrich	...	...	Mag.	.....	.....	.....	.....	.....	.....	21.00	.....
Hickman, Nebr.	Hickman	388	...	Mag.	21.00	.....	18.00	.....	16.20	.....	16.20	.....
Rochester, N. Y.	Nunda	1,140	...	Mag.	48.00	36.00	33.00	.....	27.00	.....	.....	.....
Marquis, N. Y.	Norwich	8,342	...	Mag.	57.00	48.00	39.00	33.00	27.00	33.00	27.00	.....
	Chenango	718	...	.....	.....	.....	.....	.....	.....	.....	.....	.....
New York, N. Y.	Ithaca	16,017	...	Mag.	60.00	48.00	36.00	30.00	24.00	30.00	24.00	.....
Seminole, Okla.	Seminole	476	...	.....	39.00	.....	24.00	.....	.....	.....	21.00	6.00
Monmouth, Ill.	Monmouth	10,346	2,730	Mag. and C. B.	45.00	39.00	27.00	24.00	18.00	48.00	42.00	.....
Boone County Rural, Ill.	Belvidere	7,253	...	.....								
	Bonus	...	...	.....								
	Flora Spring	...	...	Mag.	.....	.....	27.00	24.00	21.00	.....	.....	.....
	Caledonia	300	...	.....								
	Boone	...	...	.....								
Carroll County, Ind.	Delphi	2,161	...	C. B.	36.00	30.00	24.00	.....	18.00	.....	.....	.....
Max, N. D.	Max	369	57	Mag.	30.00*	.....	18.00*	.....	.....	.....	.....	.....
Langdon, N. D.	Langdon	1,150	373	Mag.	36.00	.....	21.00*	.....	.....	.....	27.00	.....
McMinnville Local & L. D., Ore.	McMinnville	2,400	760	.....	42.00	36.00	21.00*	18.00*	.....	.....	.....	6.00
Springfield, S. D.	Springfield	695	...	Mag.	24.00*	.....	18.00*	15.00*	.....	.....	15.00	.....
Farmers' & Merchants', S. D.	Avon	525	...	Mag.	24.00*	.....	18.00*	15.00*	.....	.....	15.00*	.....
Skillett Falls, Wis.	Baraboo	6,324	...	Mag.	.....	.....	.....	.....	.....	.....	15.00	.....
Freeport Telegraph, Pa.	Freeport	2,248	...	Mag.	33.00	30.00	24.00	.....	.....	.....	.....	.....
Citizens', Ill.	Lawrenceville	3,235			36.00	33.00	21.00*	18.00	.....	.....	15.00	6.00
	Bridgeport	2,703	2,197	Mag.								
	Sumner	1,413			30.00	27.00	18.00*	15.00	.....	.....	15.00	6.00
	St. Francisville	1,391										
Byron, Ill.	Byron	932	...	C. B.	30.00	.....	24.00	.....	18.00	24.00	21.00	.....
	Stillman	500	...	.....								
Napoleon, Mo.	Napoleon	146	...	Mag.	21.00	21.00	18.00	15.00	.....	.....	.....	.....
	Wellington	558	...	.....								
Harrison County Mutual, Mo.	Brooklyn	71	...	Mag.	12.00	.....	12.00	.....	.....	.....	.....	.....
	Martinsville	88	...	.....								
Kingston, Mo.	Kingston	535	...	Mag.	24.00	.....	15.00	.....	.....	.....	.....	.....
Auxvasse, Mo.	Auxvasse	411	...	Mag.	24.00*	.....	15.00*	.....	.....	.....	.....	.....
Mohall, N. D.	Mohall	712	...	Mag.	33.00	.....	21.00	.....	.....	.....	21.00	.....
Williams County Mutual, N. D.	Ray	679	...	.....								
	Alamo	...	...	.....								
	Kahl	...	460	Mag.	36.00	.....	21.00*	.....	.....	.....	27.00	.....
	Hanks	...	...	.....								
	Grenora	25	...	.....								
Rathburn, Wis.	Rathburn	...	56	.....	.....	.....	.....	.....	.....	.....	18.00	....

†Measured service. ‡Coin box subscribers. ¹Metallic circuit. ²Grounded circuit. *Desk sets $3 per year extra.

New Rate Schedules Approved by Various Public Utility Commissions and Published in "Telephony" During January.

Stock Issue by Wisconsin Company Approved by Commission.

On April 18, the Wisconsin Railroad Commission authorized the Orfordville Telephone Co., of Orfordville, to issue 140 shares of its capital stock of the par value of $100 per share, making a total issue of $14,000, for the purpose of bringing the total of its outstanding stock, bonds, notes, and other evidences of indebtedness more nearly to an equality with the value of its property.

The commission found that the value of the property of the company for the purposes of this proceeding was at least $29,000. This stock is to be distributed, equally, share for share, among the holders of the stock of corporation now outstanding.

Operating Revenues Show Deficit —Higher Schedule Approved.

The Edgar Local Telephone Co., operating in the village of Edgar, Wis., Marathon county, and serving 99 subscribers, was given permission on April 30 by the state railroad commission to increase its rates from $1.50 to $2 per month for business subscribers and from $1 to $1.35 per month for residence subscribers.

The company affords switching service to 135 subscribers of the Narathon County Telephone Co., and 41 subscribers of the Edgar, Cassel & Emmett Telephone Co. are connected to the switchboard at Edgar.

The year ending December 31, 1920, showed a net operating deficit of $248.76 for the company. The total operating revenues were $1,855.22, while the operating expenses were $2,103.98.

Commission Outlines Joint Construction Agreement.

The Wisconsin Railroad Commission issued an order April 30, in which the privilege was given to the Bangor Telephone Co., of Holmen, to place its own cross arms and wires on the poles of the Holmen Service Co., where the poles of the latter have been set in conflict with the telephone wires. This privilege is to be granted without payment by the telephone company of any portion of the construction cost of lines.

If this plan is not acceptable to the Bangor Telephone Co., the order of the commission further states that the Holmen Service Co. will be required to move the telephone lines to the opposite side of the highway, providing the proper clearance. In this case the Bangor Telephone Co. shall bear the cost of all improvements and material as may be required.

This order is the result of a complaint filed by the Bangor company against the Holmen company, in which it was stated that the Holmen Service Co. had placed its poles between the wires of the telephone company from the limits of the village of Holmen north for the distance of a mile and contemplated continuing under the conditions.

The poles of the electric line are in contact with the wires of the telephone line. This is in violation of the commission's orders on standards for safe construction and operation of electric lines.

The lines of the Holmen Service Co. are well constructed with poles of sufficient height to permit joint construction, but no agreement had been entered into with the Bangor Telephone Co.

Telephone Companies May Consolidate in Pennsylvania.

Constitution article 16, § 12, prohibiting the consolidation of telegraph companies is held inapplicable to telephone companies. —Shaffer vs. Public Service Commission; Supreme Court of Pennsylvania; 111 Atlantic, 887.

Telephone Rates Controlled by Franchise Contract.

Where a company operating a local telephone exchange accepted a franchise fixing the rates, the courts cannot annul the contract because labor and materials had increased so that it was no longer profitable. Hence, in a suit to enjoin the collection of increased rates such facts constituted no defense.

As an act of congress, under which the federal control of telegraphs and telephones was terminated, provided that existing rates as established by the Postmaster General should be continued for four months, unless sooner modified by the local authorities, a rate fixed by the Postmaster General which exceeded the franchise rate of a local telephone company remained in effect until the end of the four months, the rate not being modified or changed.

Hence, in a suit to enjoin the charging of the increased rate, the company could not be required to repay the excess in rates charged during the four-month period—Texas Telephone Co. v. City of Mart; Court of Civil Appeals of Texas; 226 Southwestern, 497.

Summary of Commission Rulings and Schedule of Hearings.

FLORIDA.

May 18: Hearing at Tallahassee on petition of the Southern Bell Telephone & Telegraph Co. for permission to increase rates throughout the state.

IDAHO.

April 23: Application filed by the Stites-Kooskia Telephone Co. for authority to increase rates.

INDIANA.

May: Application filed by the Southern Indiana Telephone & Telegraph Co., of Brownstown, Vallonia, Tampico and Crothersville, for authority to increase its rural rates.

May: Permission granted the Rochester Telephone Co., of Rochester, to transfer $18,000 of its preferred stock to common stock.

KANSAS.

April 27: Applications of the Shawnee Independent Telephone Co., of Silver Lake, and the Farmers Telephone Co., of Sylvia, denied.

MINNESOTA.

May 3: Order issued authorizing the United Telephone Co., of West Concord, to purchase all of the physical property and other assets and liabilities of the West Concord Farmers and the Mutual Telephone companies of West Concord.

May 20: Hearing at Hector on application of the Hector Telephone Exchange for authority to increase its local and rural rates and establish service connection and other miscellaneous charges at Hector.

MISSOURI.

April 25: Order issued authorizing the Butler Rich Hill Telephone Co. and the Charlotte Telephone Co. to cancel and withdraw schedules of toll rates now on file with the commission for messages transmitted over their toll line between Butler and Virginia, and directing companies to render such service free of charge, pending further order.

April 26: Order issued permitting the Winfield Telephone Co., of Winfield, to continue in effect present schedules of rates for a further period of 13 months.

April 26: The Liberty Telephone Co., authorized to file a schedule of increased rates, effective May 15, to remain in effect for 13 months.

April 26: The Wessel Telephone Co., of New Haven, authorized to charge $2 per month for individual line business service and $1.50 per month for individual line residence service. Rates for subscribers owning the telephone instrument are 25 cents per month lower than the foregoing rates.

April 27: Application filed by the Kansas City Telephone Co. for authority to issue bonds under its first mortgage to the amount of $2,000,000.

April 28: Order issued authorizing the Kansas City Long Distance Telephone Co. authorized to file a schedule of increased rates for its exchange at Norborne to remain in effect for a period of 13 months.

April 28: The Kahoka Telephone & Construction Co., operating in Kahoka, granted schedule of increased rates to become effective May 15 and remain in effect for 13 months.

NEBRASKA.

May 2: In the matter of application of the Kearney Telephone Co. for an increase in rates of 75 cents on business and 50 cents on residence service; company authorized to collect 50 cents and 25 cents respectively for each service until the 1st of February next; application for cancellation of free service to Riverdale denied.

May 2: Complaint filed by C. S. Hunt, of Vernon, against the Southeast Nebraska Telephone Co., alleging refusal to discount bill during a no-service period.

May 3: Complaint filed by A. W. Fees, M. D., of Blair against the Blair Telephone Co., alleging that company insists on charging him a business rate for telephone located in his residence.

May 3: In the matter of application of the Spring Green Telephone Co. of Hendley, for permission to increase rates; request found to be reasonable and additional revenue necessary, and order issued allowing increase.

May 4: Complaint filed by V. F. Premer against the Dundy County Mutual Telephone Co., alleging insufficient service and insisting on an order rehabilitating property.

May 4: Complaint filed by H. C. Rowe against the Hooper Telephone Co., alleging refusal to allow a proper discount for rental payment.

May 6: In the matter of application of the Lincoln Telephone & Telegraph Co., for permission to sever toll connection at Red Cloud and exchange of Farmers' Independent Telephone Co., objections filed and hearing held; cause taken under submission.

May 26: Hearing at Hazard on application of the Hazard Telephone Co. for permission to increase rates.

NEW YORK.

May 9: Hearing at New York on petition of the New York Telephone Co. in respect to increasing rates for telephone service in New York City.

May 20: Hearing at Albany on complaints of the cities of Buffalo and Syracuse against rates of the New York Telephone Co. pending before the commission.

NORTH DAKOTA.

May: Schedules filed by the Northwestern Bell Telephone Co. and the North Dakota Independent Telephone Co. suspended for a further period not to exceed six months, pending hearings.

May: The Northwestern Bell Telephone Co. authorized to close its toll station at Kelso.

May: Schedule filed by the Northwestern Bell Telephone Co. discounting telephone rates to company employes approved.

May: Schedule of rates filed by the Farmers & Merchants Telephone Co., of Flaxton, suspended pending investigation.

May: Complaint filed by E. W. Tempelmeyer against the North Dakota Independent Telephone Co. regarding installation fee charged.

May: The Schrank Rural Telephone Co., of Grafton, authorized to extend its rural lines nine miles.

WISCONSIN.

April 30: Permission granted the Utica Farmers Mutual; the Necedah; the Plymouth; the Crawford County Farmers Mutual; the Edgar Local, of Edgar; and the Morris Telephone companies to increase rates.

April 30: The Bangor Telephone Co., of Holmen, permitted to place its own cross arms and wires on the poles of the Holmen Service Co. where its poles have been set in conflict with the telephone wires.

May 10: Hearing at Madison on application of the Lodi Telephone Exchange, of Lodi, for authority to increase its rates. U-2465.

May 11: Hearing at Madison on complaint of George Stewart against the Wisconsin Telephone Co. relative to physical connection at Chippewa Falls. U-1879.

May 11: Hearing at Madison on application of the Wonewoc Telephone Co., of Wonewoc, for authority to increase its rates. U-2479.

May 11: Hearing at Madison on application of the Lone Rock Telephone Co., of Lone Rock, for authority to increase its rates. U-2480.

May 12: Hearing at Madison on application of the Washington Telephone Co., of Sandusky, for authority to increase its rates. U-2481.

May 13: Hearing at Madison on application of the Winnebago County Telephone Co., of Oshkosh, for authority to increase its rates for summer resort subscribers. U-2492.

May 13: Hearing at Madison on investigation of the rules of the LaCrosse Telephone Co., of LaCrosse, regarding the installation of "nickel in the slot" machines. U-2462.

May 13: Hearing at Tomah on application of the Tomah Electric & Telephone Co., of Tomah, for authority to increase its rates for rural subscribers.

"Telephony's" Home Study Course for Telephone Men

A Complete Presentation of the Principles Underlying Modern Telephony in All Its Branches—Arranged Systematically So That Regular Reading and Faithful Study Will Qualify Ambitious Men for Higher Positions—Prepared Under Supervision of Stanley R. Edwards—This Section Written by Jay G. Mitchell

Quiz Questions on the Preceding Installment.

1408. Is it possible to complete the final stages of the call, after it has been delivered to the trunk contacts, *X*, *Y* and *Z*, Fig. 315, by several different forms of switching equipment? Name some of the types of switching equipment that can be employed for this purpose. Is the subscriber's line multiple and conventional connecting cord and plug a flexible switching arrangement? What are some of the general conditions that must be provided for the circuit shown in Fig. 315 when the final stages in the completion of the call are to be made by means of the conventional cord plug and subscribers' line multiple? What is the first circuit condition that must be brought about subsequent to the operation of multiple-contact relay *N*?

1409. In what respect does the line circuit equipment shown in Fig. 315 operate in the same way as the conventional common battery manually-operated line circuit equipment? What is the first immediate result of the release of the armature of line relay *B* and the restoration of its normally-open make contacts to their normal condition? Explain the path over which holding current flows through the winding of one of the units control relay *E*. Explain how multiple-contact relay *F* is de-energized and show what circuits are interrupted when its normally-open make contacts are restored to normal. When is the holding current through one of the ten-relays *D* interrupted? Explain how multiple-contact relay *G* is de-energized and its normally-open make contacts are restored to normal. When is multiple-contact relay *C* released?

1410. What conditions must be brought about before multiple-contact relay *M* can be released? Trace the circuit through which holding current flows through the windings of multiple-contact relays *L* and *N*. Which relay controls the release of multiple-contact relays *L* and *N*? What additional function may be assigned to the winding of relay *AA* aside from the function of controlling the operation of its contacts? How is the wire which controls the operation of multiple-contact relay *M* in each trunk circuit switched to the next trunk circuit equipment as the associated trunk is seized?

1411. In a system which does not include switches for completing a call after it is delivered to the trunk conductors *X*, *Y* and *Z*, how is the normally-closed make contact *BB* operated? After the operation of relay *AA* and cut-off relay *A*, what is the condition of all of the other equipment associated with the control as shown in Fig. 315?

1412. Are any substantial modifications required in order to adapt the circuit arrangement shown in Fig. 315 to operate with cord plug and multiple or subscribers' lines?

CHAPTER XXXIII.
Operating Combinations Including Switches (Continued.)

1413. *Reliability of series contacts.*—In connection with the development of the present standard of the bridge multiple manual line circuit it was supposed that the use of series contacts in the subscribers' line circuits was an element of more or less danger. This was ascribed to the possibility of such a circuit being imperfectly completed when such series contacts, having been operated, were released and restored to normal.

This was unquestionably due to the difficulty of inspecting and adjusting inside normally-closed break contacts of multiple line jacks. Even when the difficulty of making such inspection and adjustment was given full consideration it appears that the sentiment against properly constructed series contacts is not justified. A very large proportion of the difficulty experienced with series contacts was due to the use of improperly constructed contact points.

In the development of the art, the contact points not only of jacks but also of keys and relays came to be constructed from metals of refractory character and in conformity with mechanical designs, which eliminated almost all of the trouble formerly experienced. It is, of course, necessary now, as always, to provide for sufficient length of contact spring in relays as well as keys to permit of operation without imparting a permanent distortion to the spring and a consequent modification of the normal contact conditions which it controls.

When springs of adequate length are used and when contacts are so constructed as to be either made from points of a satisfactory metal or to be self-cleaning as operated, no difficulty is experienced due to circuit interruption.

The use of contact springs of adequate length provided with contact points of a satisfactory metal is very well illustrated in the design of the standard type of the conventional common battery relay such as is shown diagrammatically in Fig. 113. A very slight consideration of this figure will show that the amount of spring deflection per unit of length in the contact operation is very slight. This means that the natural elasticity of the metal will restore it to its normal condition as soon as the pressure of the relay armature is removed.

The contact points being placed at the extreme end of the springs receive the maximum displacement from the armature movement and the length of the armature insures the return of the contact to its normal condition immediately the pressure is removed. Precisely the same principle of construction is employed in the operation of the ringing, listening and switching keys and very little trouble is experienced when these contacts are constructed in such a way as to conform with satisfactory mechanical and electrical design.

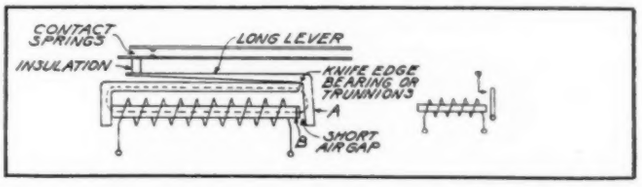


Fig. 113. Principle of Short Air-Gap Quick-Acting Relay.

1414. *Self-cleaning contacts.*—In the multiple-contact relay shown in Fig. 316, the contacts are of another type. It will be readily seen from an examination of the figure that these normally-open make contacts consist of a round spring contact wire which is moved upward by the armature when the relay is energized and which slides between the two flat curved springs which together form the other terminal of the same contact.

The action in this case is precisely the same as the making of the contact in the conventional type of knife switch used on

the power switchboards of telephone exchanges and in other places where currents of large value are controlled In a contact of this type, where one member slides between the two jaws of the other member, each operation of the switch mechanically scours the two.

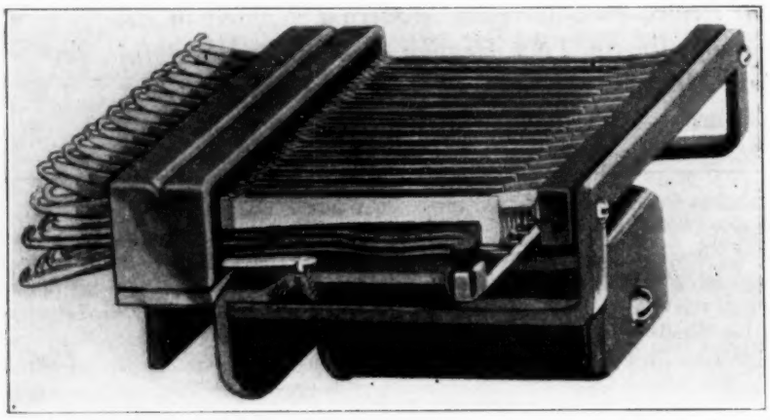


Fig. 316. Multi-Contact Relay With 31 Knife-Blade Contacts.

When the design is in conformity with sound electric and mechanical principles such a contact is positive and reliable and has a comparatively large current-carrying capacity. The use of this type of contact eliminates the necessity of employing contact points of an expensive refractory metal and in the relay shown in Fig. 316, also affords a means of securing uniform action in a comparatively large number of normally-open contacts which must be simultaneously operated.

The self-cleaning type of contact is obviously the one that is used between the wipers of the ordinary mechanically-operated telephone circuit switch and its associate bank contacts. Each movement of the switch wipers across the surface of the bank contacts mechanically scours both the contact surface of the wiper and the surface of the bank contact with the same result as the knife, switch contact blade and jaws produce.

It is worthy of note, therefore, that the series contact in the telephone circuit has been unjustly criticized, but that modern design has eliminated the cause of the trouble formerly experienced with series contacts so that a great number of relay contacts and bank and wiper contacts may easily be included in the trunk circuit as it is built up by modern high efficiency telephone equipment without serious danger of interruption in the telephone circuit over which transmission must be obtained.

(To be continued.)

Meeting of East Central Indiana Telephone Association.

The business men of Greenfield, Ind., and the Greenfield Telephone Co. were hosts to representatives of the East Central Indiana Telephone Association at the organization's quarterly convention and operators' school, held in Greenfield on Thursday, May 12.

The morning session opened at 10:30 with an address by Ora Myers, mayor, and response by Max F. Hosea, of Indianapolis, secretary of the Indiana Telephone Association.

The afternoon session consisted of addresses by Henry A. Barnhart, of Rochester, and George Barnard, new member of the Indiana Public Service Commission; also several reels of moving pictures and a reading of some of Riley's poems by W. A. Hough.

During the past year, the Greenfield company has put up and cut into service more than 11,000 feet of cable and 45 new cable terminals, has remodeled and redecorated the interior of its building, put in a new power apparatus, a new full multiple toll board and has provided a restroom for its employes. Several other new features have been added to the switchboards.

Telephone Section, Western Society of Engineers, Elects.

At a meeting of the telephone, telegraph and radio engineering section of the Western Society of Engineers on May 7, officers for the new year beginning June 1, were elected.

The new officers are: Chairman, Stanley R. Edwards; vice-chairman, Fred L. Baer; and director for one year, E. H. Bangs. Maurice A. Frye and Montford Morrison are the other directors of the section.

A most interesting paper on "Office Building: Telephone Cable Installations" was presented at this meeting by Thos. B. Lambert of the engineering department of the Illinois Bell Telephone Co.

MISS TEMPERAMENTAL

By Miss Anne Barnes.

Traveling Chief Operator, Iowa Independent Telephone Association, Des Moines, Iowa.

Have you met her? No? Oh, I am sure that you have. Perhaps you do not recognize her under her new name, for although not necessarily married, she has changed her name. I do not like her old one, therefore I will make no reference to it. But I would like to mention this fact—her disposition is still labeled under the old name.

She is sometimes an only child. In her childhood she has been humored and petted to the extent that only her immediate family, not including other relatives, can adjust themselves to her moods; her flashes of temper; her selfishness; her unexpected well-to-sick, and sick-to-well spells.

No matter in what circumstances her family is, she gets all she wants, so that she does not realize what anticipation, realization and disappointment mean. To me, this is one of the greatest disasters in life.

There sometimes comes a day when circumstances make it necessary for her to seek employment. No business firm has ever considered her when in need of an employe. I am thinking of the small town Miss Temperamental.

She applies for work when none comes to her. As she has never been employed there is only her school record to which to refer. But that is usually an open book in the small town. The possibility of her being accepted depends upon how badly the business firm needs help.

She is accepted, we will say. This is when the policies of her employer should be revised to suit her particular circumstances, regardless as to whether they have, in times past, proven satisfactory to other employes.

If concessions are made there is trouble; if they are not made the same little seed of discord thrives. From the seed disorganization in time grows. She becomes a wedge between the employer and other employes. When this fact is discovered she is frequently set outside of the organization but not frequently enough.

Moral: If you have a bad *disposition*, do not change your *name*, but change your *ways*. What's in a name?

Queries — What's Your Problem?

Common Return Wire Would Not Eliminate Cross Talk.

We have 29 1,600-ohm bridging telephones connected to grounded lines as shown in the accompanying sketch (Fig. 1). The lines are about two miles long of No. 12 B. B. iron wire. Would it eliminate the cross talk to put a No. 12 B. B. iron wire over these lines and ground is near the telephone and not at the office?

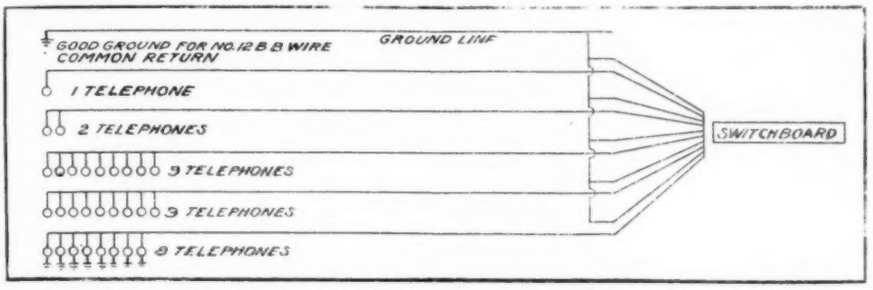


Fig. 1. Sketch Showing Bridging Telephone Connected to Grounded Lines.

A No. 12 B. W. gage iron wire could not be used for a common return in the case you have. The ordinary rule for a common return wire is that its resistance should be equal to the average resistance of the lines divided by the number of lines. In this case the resistance would have to be about one-fifth of the resistance of a No. 12 iron wire.

If the resistance of the return wire is too great, the cross talk will be very severe. In fact, if a No. 12 iron wire were used as you suggest, the lines would act very much the same as two or more metallic lines do when they are crossed. Grounding at the distant end of the proposed return wire would not help much.

Phantom circuits might be used in this case to reduce the cross talk somewhat by making part of the lines metallic. Two possible ways are shown in Fig. 2. In Fig. 2-A, two metallic and three grounded lines could be arranged from the existing wires. In Fig. 2-B, four metallic and one grounded line could be secured by stringing one more wire.

It must be remembered that the wires of a phantom circuit must be well balanced if the phantom is to be free from noise and cross talk. The wires must have equal resistances and must be kept free of grounds. They should also be transposed properly. If the phantom coil is used on a long line, it should have proper protection from lightning and high voltages.

Lines Ring All Right But Dead When Talking Is Attempted.

As I have been reading your valuable magazine for some time and find some very fine reading and worth-while-remembering facts in it, I hope you will permit me to ask you the following:

We are a mutual farmers' system. We have ten party lines and four trunk lines, use a Stromberg-Carlson switchboard, two gravity batteries and use a 2,500 ohm hand generator for ringing. Some of our lines have 12, 14, 16, 18, and one line 20 telephones. There are times when certain lines—not always the same lines, probably No. 7 today, No. 14 a trunk line tomorrow, and probably in a day or two more, another line or two—will ring through O. K. but are absolutely dead when it comes to talking over them. Apparently the line in question is not grounded as it runs light in ringing on it and you can ring the farthest telephone on the line, which would be about six miles.

We have had trouble of this kind off and on for some time and have been unable to locate it, and you can be quite sure any suggestions or advice you can give us will be highly appreciated. We use the grounded system.

The trouble you describe is due probably to too high resistance joints in the lines. Much trouble of this kind results from unsoldered connections between iron line wire and copper bridle or copper interior wire.

If the joints are not soldered, an electrolytic action takes place which corrodes the wires. This results in a very high resistance joint at times. Due to the high pressure of the ringing power, the ringing current will flow through the high resistance and the bells will ring OK.

The talking current is sent out at a very much lower pressure and consequently the line acts as if it were open and would be absolutely dead. Due to changes in temperature and to the moisture at times, the lines will not show trouble and at other times will be out of service.

High resistance joints in the iron line wire, due to rust or improper cleaning, would cause the same effect. These high resistance joints are rather difficult to locate without a resistance measuring instrument. Usually tests must be made at different points until the trouble is located between two places and then each joint is tested until the defective one is found.

Many times it is difficult to locate this kind of trouble as the trouble disappears while the line is being worked upon. However, if all the unsoldered joints are gone over and soldered securely, it is probable that the trouble will not return.

Protection Recommended Where Twisted Pair Wire Is Used.

We are planning on installing some new cable for our city plant and will use twisted pair for the drop wires. We would like to know if it is advisable to use protected terminals where the drops are short and also whether we should use protectors at the houses.

It is our opinion that protected terminals are not required where twisted-pair distribution is used and the length

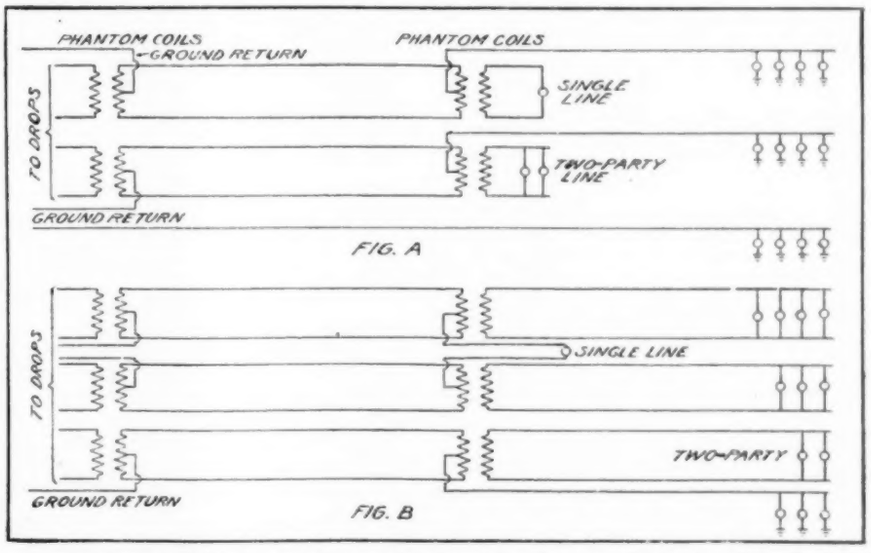


Fig. 2. Two Methods of Reducing the Cross Talk by Use of Phantom Circuits.

of the lines is not great. There is small chance of lightning damage where the length of the drop and perhaps three or four spans of twisted wire is all of the line that is exposed. The object of protection at the cable terminal is to prevent loss of cable pairs due to damage from foreign voltages or currents. The probability of damage in such a case is so small that the expense of protectors does not seem to be justified.

On the other hand, it is our opinion that protectors should be installed at the house. In this case, it is a question not only of protection to the property of the telephone company but of property and person of the subscriber as well. A telephone company which is unfortunate enough to have a case where a subscriber is injured or killed, will have a very poor defense if it can be shown that it has not installed all of the best safeguards.

A company which does not have a suitable protector at the telephone or at the house, or does not have the protector properly grounded, will be held to be negligent and, therefore, subject to the payment of damages. Even though the probability of trouble is small, it seems that the best policy would dictate that a protector be installed at the house.

Current for Ringing Purposes from Farm Lighting Set.

We have recently installed in our town a Delco light plant. The man who sold us this outfit told us that we could run our power generator on current from this plant much cheaper than from dry batteries.

Now we have a Warner generator that is supplied with current for ringing from 40 to 50 dry batteries which would represent, I suppose, 40 to 75 volts. All our lines are grounded. We have a storage battery, consisting of 56 cells, at the lighting plant, which is near our central office. This battery has a voltage of about 112 when the engine is still. How can we apply current from this battery to our generator? Can we not use, say 30 or 40 of these cells, wiring direct from them (leaving out the engine) to our generator and get same results as with 40 to 60 dry batteries?

What will be the cost of such current at the rate of 50 cents per lamp per month.

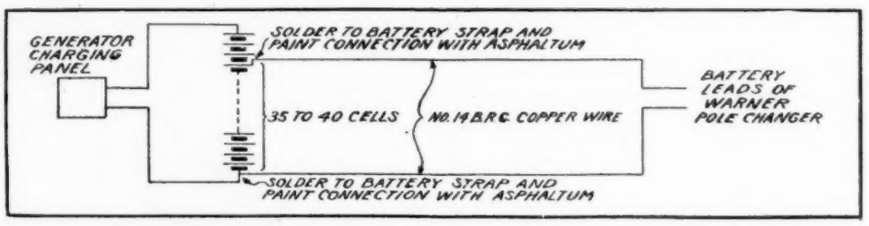
There is no reason why the current from your storage battery can not be used for the source of power for your Warner generator. Separate leads can be run from the battery terminals directly to the battery terminals of the pole changer without going through the charging panel of the generator set. These leads should be soldered to the battery straps and painted well with asphaltum paint.

The voltage per cell of a storage battery is about 2 volts and the voltage of a dry cell when new is about 1½ volts so that about three-fourths as many cells of the storage battery would be required as you are now using with the dry cell battery. Probably 35 or 40 cells would be about the right number.

This scheme of connection will place a small load on some of the storage cells that is not carried by the other cells. However, the amount of power used is very small and there would be no trouble from this source.

As to the cost, a study of the cost of alternating current for ringing in an exchange of about 600 stations, mostly rural, indicated that the cost per month would be only 30 to 50 cents.

It is customary to place a 25 or 50-watt lamp in series with the ringing mains on the switchboard to protect the generator against overload when ringing on a grounded or shortcircuited line. As current is flowing through this lamp only when a ringing key is operated and as the lamp seldom carries current enough to light it, it can be seen that only a very small amount of energy is consumed and the cost per month is small. It will probably run somewhere in the neighborhood of the cost of operating a lamp of the size used in the ringing leads.


GENERATOR CHARGING PANEL
SOLDER TO BATTERY STRAP AND PAINT CONNECTION WITH ASPHALTUM
35 TO 40 CELLS
NO. 14 B.R.S. COPPER WIRE
BATTERY LEADS OF WARNER POLE CHANGER
SOLDER TO BATTERY STRAP AND PAINT CONNECTION WITH ASPHALTUM

Connections for Using Storage Battery for Operating Pole Changer.

"Dry Core" Lead Covered Cable and Origin of Term.

What is meant by "dry core" cable and why is it called so?

"Dry core" is an arbitrary name for paper-insulated cable. This designation was adopted to distinguish such a cable from an earlier type of cable in which the conductors were covered or insulated with rubber and the cable filled with compound. The term "dry core" is no longer used in telephone nomenclature.

Difference Between Quadded Cable and Straight Cable.

Explain the difference between quadded cable, and straight cable, paper insulated cable, cotton insulated cable, and where and why is each type used.

The difference between quadded cable and straight cable lies in the fact that in quadded cable, each two pairs of conductors—called a quad—are so arranged as to make possible the operation of a third circuit over the two pairs, commonly called a phantom circuit, while in the straight cable no such arrangement is provided.

In paper-insulated cables, the conductors are insulated by wrapping with paper, while in cotton-insulated cable the conductors are insulated by a wrapping of floss silk and cotton thread or yarn.

Quadded cables are used wherever it is necessary in the operation of phantom circuits, usually in connection with toll lines, to obtain a better electrical balance between the various phantom and physical circuits than is possible with straight cable.

Paper-insulated cable is usually used in underground and aerial work outside of the central offices, while cotton insulated cable—also wool insulated—is used for terminating paper cables and for work in central office and P. B. X. equipments.

Paper-insulated cable is used in the underground and aerial work on account of its being cheaper than the cotton insulated cable, but in the central office work cotton insulation is necessary on account of the handling of the wires where they are formed out to fit the various terminals and pieces of equipment.

Use of Condensers in Magneto Telephones.

Why is it necessary to have a condenser in the ringing circuit of a party line magneto instrument? How many such telephones would work properly on a line without condensers?

It is not necessary to have a condenser in the ringer circuit of a magneto telephone. The principal purpose of the condenser is to operate in series with the receiver and act as a higher resistance bridge on the line when the receiver is accidentally left off the hook. This higher resistance bridge prevents short-circuiting the low-frequency currents, but, of course, is a partial short circuit to talking current.

As long as the condenser is in the set, it is desirable to connect it in series with the ringer, providing all the sets on the line are so connected. The condenser in the ringing circuit prevents the burning of ringers when the telephone line comes in contact with a power circuit having a voltage below the operating limits of the protector. The condenser also helps the testers in giving a clear line for testing.

Approximately 20 2,500-ohm bells may be bridged across the line where the ringing is all done by the operator using a power generator. A smaller number may be connected where all sets are equipped with a condenser in the ringer circuit. Of course, these numbers are not quite so definite as the length of line, insulation, spacing of sets, etc., have bearing on the number.

What Is Your Company Doing?

Chats About Company's Doings.

By Stanley R. Edwards.

Over 1,100, St. Paul, Minn., telephone users are better subscribers, having more patience with the operators and using more care in calling numbers, since the Tri-State Telephone & Telegraph Co. began instructing the public in the telephone business by showing visitors through its plant.

"Educational Publicity," it is called—and the practice is every bit of what the term indicates. It is publicity that educates. Many a woman, and even men, had been harboring a wrong idea of what a telephone company is made up of. An intelligent explanation of the duties of an operator and the sight of a roomful of girls handling calls at a switchboard changed their conception.

One woman was heard to exclaim after seeing an operator skillfully handle the cords: "Why, I thought that my telephone had an operator who had nothing to do but to answer when I called."

Business men, who had been in the habit of railing at the operator for petty reasons, would leave the operating room saying that they would have more patience with the girls after seeing what they had to contend with.

The quantity of equipment and material necessary to keep a telephone system working and the many departments to carry on the work were revelations to most of them. The statement that the Tri-State company has over $16,000,000 invested in equipment had a new meaning to them after seeing some of the "works."

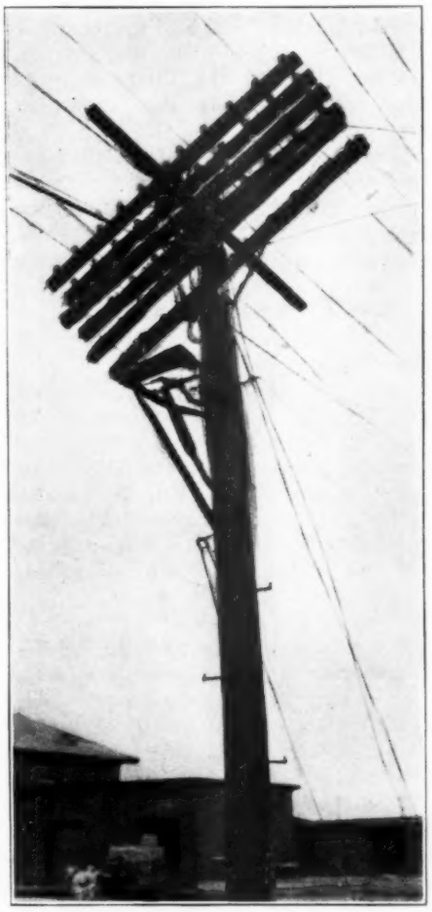
Men and women from almost all kinds of business were entertained. Every prominent club in St. Paul has made the trip. The largest number instructed at one time was 147 women of the Business & Professional Women's Club.

A group is taken on a tour of the entire seven floors of the Telephone Building, including the famous tunnel carved in the sand rock which conveys cable under the city. On the tour are seen the general offices, accounting and engineering departments, the Cedar exchange switchboard of 90 positions, the terminal room and the local office. The trip generally winds up in the big cafe where a bounteous dinner is served, after which an official of the company or another competent person, gives a talk on the telephone situation.

There is no doubt that the people of St. Paul have formed a more favorable opinion of the Tri-State Telephone & Telegraph Co. through this kind of publicity.

At Independence, Kans., a direct stroke of lightning hit a pole of the Kansas City Long Distance Co. The accompanying illustration shows the result.

The cable box was set afire and completely destroyed and the pole itself was burned in two just below the cross arms. So sleet is not the only cause of pole replacement. Lightning, however, does not often hit a pole.



Sleet Not the Only Pole Enemy—Fire Did This.

The Olathe Citizens Telephone Co., of Olathe, Kans., was the subject of a live two-column signed article in a recent issue of the Olathe Register. Some extracts show the nice publicity the company received and the clever way the author, E. L. Matthews, wrote the story:

"During the two years just past many of the big agencies that are vital to public service have come in for round abuse. Of these, the railroads, the telegraph and telephone have been the shining marks. The average individual uses the telephone more than either of the others and so the telephone service the country over has had heavy weather.

It is not in our province to criticize the telephone business of the country, not in print, anyway. When an efficient and highly organized unit, such as serves the Olathe territory is discovered, it is worthy of note. And this business in this town, everyday, commonplace and stereotyped as such business is bound to be, shows the individuality of the men who own it and manage it.

That's why you notice probably the difference between the service of Olathe and that in Kansas City. The business is not too big to lose the personal touch and interest of a man who believes he is rendering a vital public service in connecting you up with 4-11-44-A the first time you call for it and in the shortest time, after you call for it.

Fred M. Lorimer is a walking, quick-thinking, tremendously efficient telephone exchange. I went to Fred Lorimer to find out a little about the telephone as a public servant and I expected technicalities. I thought I would hear of troubles, unappreciative public, high costs and all that sort of thing. Instead of that I have found that there is a whale of a story right there in the Olathe exchange.

Instead of meeting troubles half way, The Force goes to the place where they live and bat their brains out before they have a chance to grow up and raise families. Lorimer has a clear brown eye with a twinkle in it. He's husky and ruddy with the skift of gray in his hair that is his badge of service in this business. Let's hope you don't help to put it there.

Because he believes that the telephone business is the best business in the world, Fred Lorimer is in it. Being in it, he is of it. Better still it is of him—a part of him. As he passes through the exchange, back of the boards among the intricate tangle of thousands of wires and big cables, he touches them as a pianist runs his fingers caressingly over his keyboard.

He spotted his goal from afar and after deciding that he wanted to run an office and exchange he proceeded to find out all he could about it and then resolved to have the best telephone exchange there was—not the biggest, mind you, but the best. I think he has it.

A telephone switchboard, especially from the back, makes Isenstein's Theory of Relativity look comparatively simple and yet Lorimer can tell within eight feet of wire where any trouble is on any of the lines of his 1,100 subscribers."

We'll say that Fred Lorimer is a real

1921 telephone man—right up to the minute and then some. If he impresses a newspaper man the way the Olathe Register man says he did, why then he does the same with his subscribers and undoubtedly has good public relations.

Mr. Lorimer talked some to the newspaper man for the article says:

"What is the telephone worth? That's hard to answer. I can tell you what it means—that is a little of it. It's worth considerably more in service than it is in money probably, if we could only realize that. For instance, during the 'flu' epidemic two years ago—that can't be measured in money.

"We had only three of our girls left at work out of 18, working night and day, sometimes even eating their meals in the office. Yet we kept hitting the nail hard. We had to, and I know of one instance where to save time, our operator kept on one doctor's trail and had him make 17 calls without returning to his office, catching him at one place and sending him on to another.

"Some time ago I asked 30 farmers to figure conservatively what the telephone was worth to them each month in dollars and cents. Do you know what the average of their estimates was? Well, it was $17 per month. Now farmers don't make any rash estimates and those figures are conservative.

"A telephone instrument looks pretty much the same anywhere. What it is worth to you depends upon the intelligence, good will, co-operation, ability and reliability of the management. The young ladies we have at our board are not picked haphazard. We have standards and we adhere to them closely."

"It is my humble opinion that the city of Olathe has mighty good telephone service 24 hours every day," is the conclusion of the newspaper man. "The answer is in the foregoing. Some of us who travel the iron trail long and often, have learned to appreciate a great organization started years ago by Fred Harvey to serve food and give shelter to patrons of the Santa Fe railroad. Today people prefer to leave the train and walk to a Harvey eating house because they know they will get good food, properly served by genteel people at a rather stiff price.

"They pay more money and go out of their way—why? Because there is something in intelligent, willing service that amounts to more than money or a little inconvenience. It's largely a game of give and take in business today and a good many hard-headed business men are coming to find that the more they give the more they get.

"The dollar is getting to be elusive and coy. But when you can get men to admit that they get $17 for spending a fraction of that amount, the salt and the bird are very near together.

"If the people of Olathe agree with this estimate of one of their service corporations—Olathe should be holding a master school for the telephone business—it's needed everywhere."

Holding one telephone number for over 40 years seems almost impossible in this day of rapid changes and steady removals, but Main 312, held by Hewett & Creel Brown, a Louisville, Ky., concern, has been held by the Brown interests since telephones were first known in Louisville.

With the signing up of Louisville business men back about 1876 for "newfangled" telephones, when the telephone industry was in its infancy, J. T. S. Brown & Sons, secured line 312. During the war period the company sold its big Main street warehouses, and moved to offices in the then Paul Jones building, and held the line.

Later the old company was dissolved, and Creel & Hewett Brown opened an office together in the Starks building, and carried the line with them. For some years the company had City 312 as well.

Hewett Brown, in commenting on this matter, said: "That is a long time to hold one line, and marks two generations that have had use of the number."

A short time ago, the New York Times in commenting on telephone service in New York City, brought out some points telephone men have frequently endeavored to bring before their public. Said the article in the Times:

"There is no doubt that there has been and is a great improvement over the state of affairs, telephonically, that existed during the closing years of the war and for more than a year after it had ended, and though there are some people who insist that delays and mistakes remain more numerous than they used to be in the good old days before the Germans went mad, the probabilities are that these laudators of the past have forgotten ancient woes, and think they remember a golden age that never really existed, for telephones any more than for anything else.

As a matter of fact, it always has been the fashion to complain about the telephone service—to take for granted and allow to pass without comment the innumerable times when connections are made promptly and accurately, and to talk wrathfully about the occasions—which were comparatively few even while the telephones were at their explicably and pardonably worst—when things went wrong.

As another matter of fact, the people who, now or at any time, proclaim themselves ill-used by 'Central' usually are those who invite by irascibility and inconsideration the sorrows from which they suffer. They forget that they are dealing not with a machine, but with a young woman who is human like themselves—one from whom it is unreasonable to demand the perfection denied to any mortals, and with one, too, whose temper and patience are subjected for many hours each day to trials about as severe as are endured by any class of workers.

Telephone users who themselves are courteous, who do not get excited over trifles, who do not expect too much, who have learned that the soft answer turns away wrath, and who realize that they are but one of several hundred thousand people with needs and rights like their own—these are they who get good telephone service when it can be given.

At all times they get better service than folks who are always on the watch for a chance to scold, and who show the coward's courage by saying to a woman miles away at the other end of a wire what they certainly would not dare to say to her face to face. It is for them that delays and mistakes multiply, and if some of the multiplication is in the nature of reprisal, that, though reprehensible, is quite in accord with the way the world is built and run, and probably will not change as long as the world lasts.

The chances are that now, however it may have been in war days, the telephone suffers less from the carelessness and inaccuracy of all the telephone operators combined than it does from the habit so many subscribers have of expanding what ought to be brief messages into long orations—orations that almost invariably are the longer the more trivial is their subject matter and the more of a bore it is to the reluctant listener."

Two hundred dollars was paid for a telephone number in Lexington, Ky., recently.

R. J. Colbert, master commissioner of Fayette county, sold at auction the stock of Crittenden & Cunningham, negro undertakers and embalmers, who have dissolved partnership.

The partners, B. Crittenden and E. L. Cunningham, plan to re-enter business as individuals and both wanted the use of the telephone number.

It was sold to Mr. Cunningham for $200.

The Citizens Independent Telephone Co. at Terre Haute, Ind., has installed under the direction of S. T. Van Cleave, general auditor, a mechanical method of handling its subscribers' accounts by which one clerk is able to take care of 15,000 accounts.

The company seems to be a pioneer in this method of accounting for telephone companies, which consists in the use of specially designed forms for doing the subscribers' bookkeeping with a book machine.

Biographical and Personal Notes

H. W. Wheeler, for many years district plant chief of the western division, with headquarters at Hastings, Nebr., has been appointed superintendent of construction of the entire system of the Lincoln (Neb.) Telephone & Telegraph Co., and will be transferred to Lincoln. He is succeeded at Hastings by **K. B. Cary,** of Beatrice, who was district plant chief for the southern division.

T. O. Rinehart, local commercial manager at Hastings, has been promoted to plant and commercial manager at York, while **H. F. McCulla,** wire chief, succeeds him. **Ed Cummings,** district inspector at Hastings, has been made switchboard installer for the system, and has been succeeded by **W. A. Coffendafer,** manager at York.

R. H. Ojers, district foreman at Hastings, has been made general foreman. Mr. Ojers was a captain in the signal service during the World War. All of the men who have been promoted have been in the service of the company for from five to fifteen years.

William Norman McAnge, Jr., vice-president and general manager of the Allen Properties, Corinth, Miss., is striding with pride these days. Why? Because he is the proud father of Thomas Riddick McAnge, who was born April 25, 1921. TELEPHONY extends to Mr. and Mrs. McAnge its heartiest congratulations.

R. B. Still of Tyler, Texas, **general** manager of the Gulf States Telephone Co., and president of The Texas Independent Telephone Association, was recently elected a commissioner of Tyler, an enterprising city of 12,000 population. At a later meeting of the new board of commissioners Mr. Still was chosen chairman.

Ivan Bowen, of Mankato, Minn., attorney and primary candidate for congressman from the second district in the last election, has been named to fill the vacancy in the Minnesota Railroad & Warehouse Commission caused by the death of Judge Ira B. Mills, by Governor J. A. O. Preus.

Mr. Bowen was born in Sleepy Eye, Minn., in 1886. He served as a clerk in Congress in 1904, remaining in Washington until 1913. While there he supplemented his education received in the Mankato schools and a commercial school with a law course in Georgetown University. He was in Senator Knute Nelson's office at Washington for a number of years.

He received his degree in 1911, and since 1913 has been practicing law, save during the interruption of military service, in Mankato. In 1919 he and his brother, LeRoy Bowen, established a law firm, the brother maintaining Minneapolis offices.

His war record shows that he entered the second officers' training camp at Fort Snelling, Minn., August 27, 1917, and was commissioned captain in the field artillery officers' reserve corps, November 8, 1917. He was assigned to duty in the 89th Division, Camp Funston, Kans. Reported for duty December 15, 1917, and was assigned

Ivan Bowen, of Mankato, Minn., Successor to the Late Judge Mills as Member of the Minnesota Commission.

to the 164th F. A. Brigade in command of Co. F, 314th Ammunition Train.

Captain Bowen left Hoboken for overseas June 27, 1918; trained at Camp De Souge, France, near Bordeaux. He was sent to Toul front in September; went into action at St. Mihiel drive near Flirey, St. Beausant, Siechenrey, Essey, Euvezin, Nonsard and Thiaucourt; served in support of 89th Division, 37th Division and 28th Division until signing of Armistice; transferred on November 25, 1918, to Camp Meucon, France, and assigned to 137th F. A.; left Brest on U. S. S. *George Washington,* December 15, 1918; arrived at Hoboken, December 23, 1918; discharged at Fort Benjamin Harrison, Ind., January 21, 1919.

J. W. Stover, of Marshall, Mo., has been appointed manager of the Southwestern Bell Telephone Co., at Hannibal, Mo., succeeding Frank Lathrop, who has been granted a three-month leave of absence.

D. B. Blacksten, of Ottawa, Kans., recently assumed charge of the Council Grove Mutual Telephone Co. at Council Grove, which now occupies new quarters and has installed a new switchboard. Mr. Blacksten is now directing the work of reconstructing various lines.

R. E. Brown, manager of the Western Union Telephone Co., of Newport, Ark., for the past two years, has resigned to accept the managership of the Murphysboro Telephone Co. at its Herrin, Ill., exchange.

Obituary.

Judge Ira B. Mills, chairman of the Minnesota Railroad & Warehouse Commission and the oldest public utilities official in the country in point of service, died at his home in St. Paul, last week. Death followed a stroke of paralysis suffered April 8.

Judge Mills, who was 70 years old, had been a member of the Minnesota Railroad & Warehouse Commission since 1893, when he was appointed by Governor Knute Nelson. His activities in that capacity won him a national reputation.

Judge Mills was district judge at Moorhead, Minn., and just prior to his appointment as railroad and warehouse commissioner was an assistant attorney general.

Born at Scotchtown, N. Y., January 14, 1851, his early life was spent on the farm and it is said that in his discussions and his rules he never forgot the early farm training, and often referred to it. Judge Mills graduated from the Albany School of Law in May, 1872, and opened his first office in Port Jervis, N. Y., after his marriage in 1871.

In 1881 he arrived in Minnesota and settled in Moorhead. Soon after his arrival, the law firm of Burnam, Mills & Tillotson was formed and rapidly assumed the position of the leading law firm in Clay county.

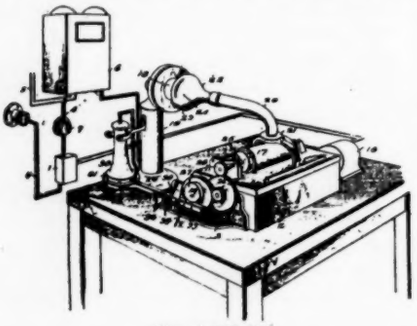
The young lawyer was much interested in politics and was induced to enter the race for judge in the eleventh judicial district. In 1886 he was elected and, when the district was divided, became judge of the fourteenth district.

In 1893, Governor Knute Nelson asked him to serve as railroad and warehouse commissioner for the state. In recognition of his splendid service, he was reappointed in 1897 and in 1898 and was elected to the same office in 1900 and served until his illness.

One of the outstanding features of Judge Mills' long service on the commission is the fact that none of his decisions on railroad matters was reversed by the courts, although there were numerous appeals. He was elected president of the National Association of Railway Commissioners in 1904.

Record of Telephone Patents

1,368,481. February 15, 1921; filed February 20, 1919. TELEPHONE ANSWERING INSTRUMENT; eight claims; W. D. Calvert, Altoona, Va. This automatic answering instrument comprises a phonograph with motor-drive mechanism. A



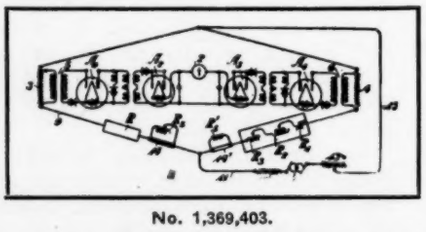
No. 1,368,481.

reproducer is in communication with the transmitter to conduct a spoken message thereto. Lifting mechanism, on a part of which the receiver is placed, is operatively associated with the motor-driven mechanism so that the receiver is lifted in the initial operation of the drven mechanism. The motor of the mechanism is in electrical association with and under control of the rnging circuit.

1,369,221. February 22, 1921; filed December 20, 1917. CONNECTING TERMINAL; 20 claims; H. D. Currier, Chicago. This connection terminal comprises a base piece and a pair of opposing wings of bendable material extending from one edge thereout and twisted into substantial parallelism. The wings are provided with oppositely extending contact portions.

1,369,403. February 22, 1921; filed March 19, 1919. TESTING APPARATUS; 13 claims; C. S. Demarest, and H. F. Shoffstall, Brooklyn, N. Y.; assigned to American Telephone & Telegraph Co. In this testing circuit is included an element of unknown characteristics and an element of known characteristics. The unknown conductor is balanced with the known conductor, the condition of balance being indicated by indicating means comprising a direct current measuring instrument and vacuum bulb elements.

1,369,630. February 22, 1921; filed March 15, 1920. SANITARY MOUTHPIECE COVER; three claims; H. P. Dempster, Minneapolis, Minn. This protector comprises a gauze sheet having one of its ends supported over the transmitter mouthpiece. Spring influenced means are connected to the opposite end of the sheet and are designed to contact with the mouthpiece



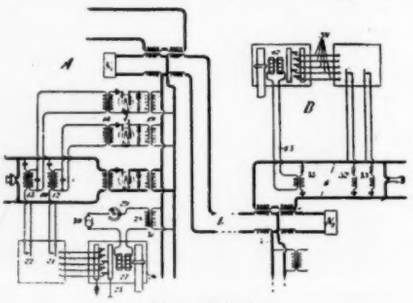
No. 1,369,403.

to exert a pressure on the sheet to hold it taut on the mouthpiece.

1,369,680. February 22, 1921; filed July 18, 1918. BANK CONTACT; two claims; F. A. Lundquist, Chicago; assigned to C. L. Redfield, trustee, Chicago. In these bank contacts of an automatic system, a series of vertical panels are supported at intervals from each other. Each panel has vertical slots arranged in vertical rows and contact strips arranged in pairs with insulation between, supported in corresponding slots in the different panels.

1,369,805. March 1, 1921; filed December 27, 1919. SECRET COMMUNICATION SYSTEM; four claims; B. T. Hamilton, Brooklyn, N. Y.; assigned to American Telephone & Telegraph Co. In this transmission system the method of maintaining secrecy in the transmission of messages between sending and receiving stations consists in distorting the outgoing message currents by subjecting certain of the frequency bands of the currents to unequal degrees of amplification, and in restoring the amplitude relation of the several frequency bands of the message currents to normal at the receiving station by subjecting certain of the frequency bands of the incoming message currents to unequal degrees of attenuation.

1,369,828. March 1, 1921; filed May 28, 1920. CABLE HANGER; six claims; E. M. Matthews, Jamaica, N. Y.; assigned to American Telephone & Telegraph Co. In this cable-supporting device adapted to



No. 1,369,805.

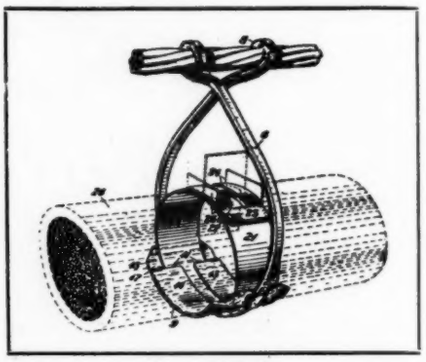
be secured to messenger wire, a ring is provided with hooked members for gripping the messenger. A clipped member mounted on the ring is retained in position by means of a band.

1,370,104. March 1, 1921; filed December 11, 1919. SANITARY COVER FOR TRANSMITTER MOUTHPIECES; two claims; S. Flack, Erie, Pa.; assigned to F. W. Flack, F. Vitron and J. Vitron, all of Erie. In this sanitary cover a mouthpiece formed of sterilizing material and conforming in general contour to the interior surface of the mouthpiece is held in place by an annular ring arranged on the periphery of the mouthpiece.

1,370,152. March 1, 1921; filed May 6, 1920. TELEPHONE ATTACHMENT; five claims; J. E. Rhodes, Teaneck, N. J. A bridge plate attached to the transmitter face plate by means of clamp on the mouthpiece is provided with an extension which carries advertising matter.

1,370,300. March 1, 1921; filed June 17, 1915. TOLL TELEPHONE SWITCHING APPARATUS; 51 claims; H. M. Friendly, Chicago. Relay mechanism is located at an interconnecting station and controlled over a simplexed circuit from an operative position for interconnecting two telephone lines between two other stations.

1,370,333. March 1, 1921; filed May 15, 1919. SYSTEM OF COMMUNICATION; four claims; W. W. MacFarlane, Elkins Park, Pa. Each station of a number of sending and receiving stations in this system of communication includes a local circuit having a primary winding in series therewith, and a secondary winding in inductive relation to the primary. A line conductor connects one side only of the two



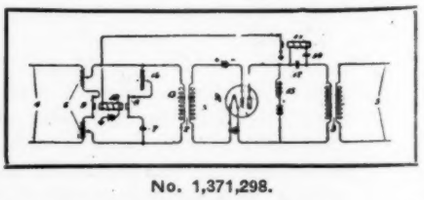
No. 1,369,828.

secondary windings, and a conductor connects each local circuit with the line conductor independently of the windings.

1,370,558. March 8, 1921; filed March 1, 1918. MACHINE RINGING SYSTEM; four claims; W. A. Rhodes, New York; assigned to American Telephone & Telegraph Co. Provision is made for completing a talking circuit in this transmission system over the back contacts of a differentially wound relay in the cord circuit, and completing a ringing circuit over the front contacts of the relay. Mechanism responsive to the connection of the cord circuit to the line energizes the relay which is released by means controlled differentially by the telephone line.

1,370,562. March 8, 1921; filed June 4, 1919. TRUNK CIRCUITS; one claim; S. B. Shackleton, New York; assigned to American Telephone & Telegraph Co. One of the windings of a transformer in the trunk circuit is included in the talking circuit of the trunk and substation, and the other winding in a normally-open circuit. A relay under control of a relay in the talking circuit controls means for closing the normally-open circuit and for opening a bridge across the talking conductors of the trunk which also includes signaling apparatus. Supervisory signaling means in the toll cord is controlled by the last-mentioned relay.

1,371,298. March 15, 1921; filed September 20, 1918. TELEPHONE AND CALL SIGNALING SYSTEM; eight claims; A. B. Clark, Brooklyn, N. Y.; assigned to American Telephone & Telegraph Co. An amplifier in this signaling system is



No. 1,371,298.

designed for a maximum amplification of currents of certain frequencies. A relay in the output circuit of the amplifier is unresponsive to currents of these frequencies but responsive to currents of a different frequency. Means are controlled

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by the relay for giving the amplifier maximum efficiency for currents of the other frequency.

1,371,717. March 15, 1921; filed December 28, 1918. TELEPHONE SYSTEM; 18 claims; R. S. Wilbur, Lyndhurst, N. J., and W. H. Bendernagel, Brooklyn, N. Y.; assigned to Western Electric Co. In this transmission system, currents of higher frequencies are transmitted over the line with greater attenuation than currents of lower frequencies. Means associated with the transmission line equalize the attenuation thereof so that currents of all frequencies within a desired range are transmitted with practically uniform attenuation. The attenuation equalizing means are rendered ineffective when currents of frequencies outside the desired range are transmitted over the line.

1,371,747. March 15, 1921; filed May 20, 1919. TELEPHONE STAND; five claims; C. Fischer, New York. This stand comprises a two-part interlocking sheet metal base, the upper part carrying one or more clamps for receiving the desk stand. A removable upright post having a rigid portion is detachably secured to the base at a distance from the desk stand. A flexible end on this upright carries a clamp for the telephone receiver so as to fix it in any desired position for listening when holding a conversation. A spring having a loop at one end holds the receiver hook in an inoperative position.

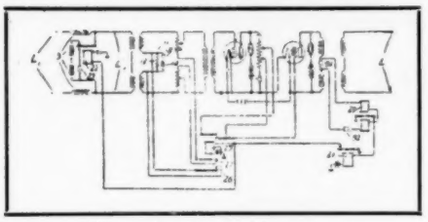
1,371,748. March 15, 1921; filed June 24, 1911. HIGH CAPACITY SELECTIVE SIGNALING SYSTEM; seven claims; J. C. Field, Orange, N. J.; assigned to Western Electric Co. Impulse-sending mechanism advances all of the selectors simultaneously. A normally-open shunt circuit associated with each selector is closed under the joint control of the impulse-sending mechanism and the selectors. It co-operates therewith for releasing the selectors at a predetermined position of their movement.

1,371,749. March 15, 1921; filed January 24, 1919. TELEPHONE EXCHANGE SYSTEM; six claims; C. B. Fowler, New York; assigned to Western Electric Co. The feature of this system is a locking relay associated with the line circuit which controls a signaling device. Two locking circuits are provided for the relay. The connection and disconnection of the cord circuit with the line circuit, determines the locking circuit to be used by the relay.

1,371,874. March 15, 1921; filed January 25, 1916. TELEPHONE SWITCHING CABINET; one claim; J. H. Ditch and W. T. Burns, Altoona, Pa. This cabinet, which has a hinged cover, has a face plate member adapted to carry all of the push keys. A longitudinal panel strip along the front at the base of the cabinet is adapted to co-operate with the base plate to form the entire front of the cabinet. A number of plug receptacles are carried by the panel strip.

1,372,042. March 22, 1921; filed December 5, 1918. DESK OPERATOR'S CIRCUIT; six claims; W. A. Rhodes, New York; assigned to American Telephone & Telegraph Co. A controlling relay and a signal-responsive relay are associated with the trunk at each of the two stations between which it extends, the latter relay being actuated by means responsive to the connection of telephone apparatus to the trunk. Means are responsive to the connection of telephone apparatus to the trunk at the other station to operate the controlling relay thereat to open the circuit of the signal-responsive relay and to maintain the controlling relay operated until the apparatus is disconnected from both ends of the trunk.

1,372,050. March 22, 1921; filed April 4, 1919. BUSY SIGNAL TESTING APPARATUS; eight claims; J. F. Toomey, New York; assigned to American Telephone & Telegraph Co. Switching means are provided in the testing apparatus whereby a portion of the circuits for the signaling means in the line, cords, and testing apparatus may be interrupted. Another switching means is provided whereby the



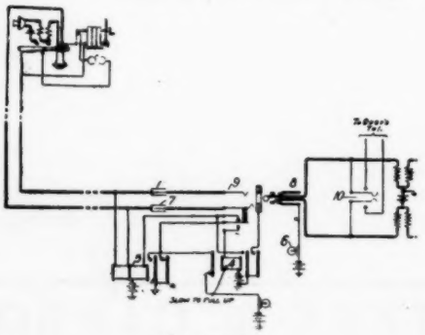
No. 1,371,717.

other portion of the circuits may be interrupted.

1,372,162. March 22, 1921; filed May 27, 1920. MUFFLER ATTACHMENT FOR TELEPHONES; three claims; D. P. Palmedo, Bridgeport, Conn.; assigned to Muffler Phone Mfg. Co., Meridian, Conn. This muffler comprises two plates, one adapted to be connected with the transmitter and the other provided with a mouthpiece. A diaphragm is located between the plates and a two-part reflector mounted in it forming a direct opening.

1,372,425. March 22, 1921; filed June 15, 1912. SYSTEM OF RADIO TELEGRAPHY AND TELEPHONY; 10 claims; J. H. Hammond, Jr., Gloucester, Mass. The stations of this system are operatively connected to transmit and receive at the same time; automatic means, operatively connected with the transmitting and receiving apparatus, causing the stations to transmit simultaneously and to receive simultaneously.

1,372,426. March 22, 1921; filed March 15, 1919. MULTIPLEX RADIO TELEPHONY; 15 claims; J. H. Hammond, Jr., Gloucester, Mass. This multiplex system comprises a single arc and a number of oscillation circuits tuned to different frequencies effectively and connected to the arc. A single antenna is operatively connected to the circuits and a signaling device arranged to control each of the oscillation circuits so that a number of messages



No. 1,371,749.

may be simultaneously connected through the antenna.

1,372,437. March 22, 1921; filed October 20, 1918. TELEPHONE SWITCH SEPARATOR; nine claims; H. Koch, Jamaica, N. Y.; assigned to Dictograph Products Corp. In this key a certain number of spaced spring strips have aligned openings therethrough. Operating means are provided for imparting movement to one of the strips with the openings.

1,372,448. March 22, 1921; filed August 27, 1918. MACHINE SWITCHING TELEPHONE EXCHANGE SYSTEM; 13 claims; L. Polinkowsky, Hyde Park, London, England; assigned to Western Electric Co. Manual switching means at an operators' position connects the telephone line to the trunk line. Means dependent upon the operation of the manual switching means render mechanism effective to control the selective operation of the remaining of the switches to further extend the trunk line.

15,068. March 22, 1921 (reissue patent 1,145,542, July 6, 1915); filed March 7, 1917. AUTOMATIC TELEPHONE SWITCHING APPARATUS; 68 claims; J. G. Blessing, Chicago; assigned to Automatic Electric Co. A rotary member actuates a circular series of movable contacts while a set of keys variably controls the travel of the member. The contacts control means for transmitting electrical impulses.

15,070. March 22, 1921 (reissue patent 1,313,570; August 19, 1919); filed October 16, 1919. SUBSTATION TELEPHONE CIRCUIT; 19 claims; B. D. Willis, Oak Park, Ill.; assigned to Automatic Electric Co. A local circuit connects opposite terminals of the transmitter and includes contact springs for closing a bridge of the line circuit, a condenser, a second winding of the induction coil, and a receiver. A second set of contact springs in this local circuit is placed between the receiver and the second coil winding.

1,372,862. March 29, 1921; filed June 30, 1917. TRANSMITTER; three claims; H. J. Carmody, Woodhaven, N. Y.; assigned one-third to J. M. Levine and one-third to H. Ufland, New York. In this transmitter a number of diaphragms are located one behind the other relatively to the approximate direction of propagation of sound waves. Guiding means enable a portion of the sound wave to reach one of the diaphragms by a comparatively direct path, yet cause another portion of the sound wave to reach another of the diaphragms by a comparatively circuitous path of substantially the same length as the first mentioned path.

1,373,164, 1,373,165, and 1,373,166. March 29, 1921; filed March 19, 1918, April 30, 1920 and December 29, 1920, respectively. CABLE SUPPORT; two, four and one claims respectively; O. W. Brenizer, Philadelphia, Pa.; assigned one-fifth to A. V. Groupe, Philadelphia. A wire cable ring is described, the method of attaching to the messenger wire and the loop for receiving the cable being different in each patent.

15,073. March 29, 1921 (Reissue patent No. 1,283,182. October 29, 1918); filed September 4, 1920. AUTOMATIC DISTRICT TELEPHONE SYSTEM; 87 claims; H. E. Hirshey, Chicago; assigned to Automatic Electric Co. In this system provision is made for operating the line switch and thereby preparing a circuit for a switching relay and for then releasing the switch. When the switch is again operated, the relay is operated over the prepared circuit, thus enabling the first and second lines to be brought into connection.

1,373,504. April 5, 1921; filed September 11, 1918. ELECTRICAL MEASURING APPARATUS; seven claims; H. W. Hitchcock, New York; assigned to American Telephone & Telegraph Co. A plan for measuring the capacity of a condenser is described. A fixed capacity condenser is arranged so that it may be automatically connected in parallel with a variable condenser.